

Graphicsworld

NOVEMBER 13
1987

WORKSTATIONS

One of the fastest
changing technologies in
the information systems
industry — Page 2

PRODUCT FILE — Page 21

Computerworld
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Three vendors led the way into the third dimension, but others are now waiting in the wings. As workstations

Design images move into 3D

JUST as the original Apple Macintosh changed the world of personal computing with visual icons, so are highend three-dimensional graphics workstations dramatically altering the design world — giving product designers the artistic tools they need to be more creative, to explore their alternative and, ultimately, to produce better and more attractive graphics products.

Designers no longer need to draw pictures or construct clay models to visualise their final products. With the help of realistically shaded three-dimensional images on high-performance graphics workstations, artists and designers can generate dozens of new models in mere minutes — compared with the days or weeks required to generate one conventionally produced draft or prototype.

As with any new technology, the first

adopters of these high-performance graphics systems were leading-edge automotive and aerospace firms. General Motors and Chrysler, for instance, use 3-D graphics workstations in some of their styling departments to conceptualise new car shapes, interiors, colors and various feature options.

But good news travels fast, and it did not take long for others to realise the advantages of near-real-time manipulation of computer images.

Kraft, for example, now uses Silicon Graphics' Iris workstations to design ketchup containers that are more attractive and appealing to shoppers. And one leading advertising firm has already begun airing catchy Benson & Hedges cigarette commercials that use advanced animation techniques made possible with today's workstation graphics.

Merely providing workstations with a lot of computing power is not enough effec-

tively to perform animation, wind tunnel simulation, molecular modelling, fluid flow or solid modelling applications.

As Tom Lasinski, workstation subsystem manager of the numerical aerodynamic simulation program at the National Aeronautics and Space Administration, points out, Cray Research's Cray 2 is 500 times more powerful than Iris, but it has no eyes.

It is the eyes — the ability visually to display and manipulate data on the screen — that distinguish 3-D graphics workstations from other systems, including technical workstations. While nearly every computer maker, from Apple and IBM to Apollo Computer and DEC has entered the low-end (less than \$US20,000) technical workstation market, only three companies have ventured into the more demanding realm of visual computing.

Even though Apollo pioneered the technical workstation market five years

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Consulting Editor: Robyn Hughes
Contributors: Mike Barraclough, Vicki Brown
Products Editor: Terry Watson
Research Editor: Gillian Sidebottom
Production Editor: David Blackburn
Assistant Production Editor: Phil King

ADVERTISING:

National Sales Manager: Susan Taylor
New South Wales: Gayle McElroy, Tim Irving, Phil Thomson
Victoria: Cherie Bridges (03) 690 2933
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West Australia and South Australia: Winkie Corfield (09) 388 1828
Co-ordinator: Cheryl Podda
Manager: Max Jaeger
Manager: Shirley Ingram
Publisher: Susan Taylor

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SYDNEY HEADQUARTERS: Computerworld Pty Ltd, 37-43 Alexander Street, Crows Nest, NSW 2065, Australia. Tel: (02) 439 5133. Telex: COMWOR AA74752. Fax (02) 439 5512

MELBOURNE OFFICE: Computerworld Pty Limited, 74-76 Eastern Road, South Melbourne, Vic. 3205. Tel: (03) 690 2933. Tlx: COMWOR AA33926. Fax (03) 690 4362

CANBERRA OFFICE: Computerworld Pty Ltd, PO Box 21, Waramanga, ACT 2611. Tel: (062) 88 6982. Fax: (062) 889 821.

PERTH OFFICE: Computerworld Pty Ltd, Suite 8, 272 Hay St, Subiaco, WA 6008. Tel: (09) 388 1828. Fax: (09) 382 3440.

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**A PUBLICATION OF
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Tektronix
COMMITTED TO EXCELLENCE

become increasingly powerful, the promise is more image manipulation at lower prices. Vicki Brown reports

ago, it was Silicon Graphics that came to market first with a 3-D graphics workstation.

Since Silicon Graphics' first Iris workstation appeared in 1985, the company has installed more than 2,000 systems for a wide variety of engineering and scientific applications — from discovering crude oil and developing new pharmaceuticals to building aircraft and bringing motion-picture animations to life.

Last December, Hewlett-Packard became the first company to challenge Silicon Graphics in the highly specialized 3-D graphics workstation arena with its announcement of the 9000 Model 350SRX. Apollo followed on HP's heels five months later with the DN 590 Turbo.

These three pioneer systems share several features, which essentially define the current state of the art. These include the following:

- Twenty-four color bit-planes providing an impressive 16.7 million simultaneous colors.

- A 19-in color monitor with a minimum of one million pixels, or 1024 by 1024-pixel resolution.

- Double buffering and Z-buffering capabilities, enabling faster manipulation of real-time objects.

- At least one specialized graphics processor to assist the main CPU with the thousands of mathematical operations required to move vectors and polygons that represent the desired object.

Realistic depiction

With the addition of optional 3-D graphics accelerators and floating-point accelerators, workstations from all three of the vendors can manipulate graphics images at the rate of more than 5000 polygons per second. Such a feat was inconceivable as little as five years ago and is a big step toward achieving the realistic depiction of graphics.

However, there is still a great deal of work to be done.

Even today's top 3-D workstations cannot realistically simulate a human being running in real-time, with on-the-spot calculations. A lifelike image of Michael J Fox dashing from his apartment for a can of soda, for example, would require millions of polygons — thousands for his face alone.

Further, to approximate the world as our eyes see it, each polygon would have to be smaller than five by five pixels.

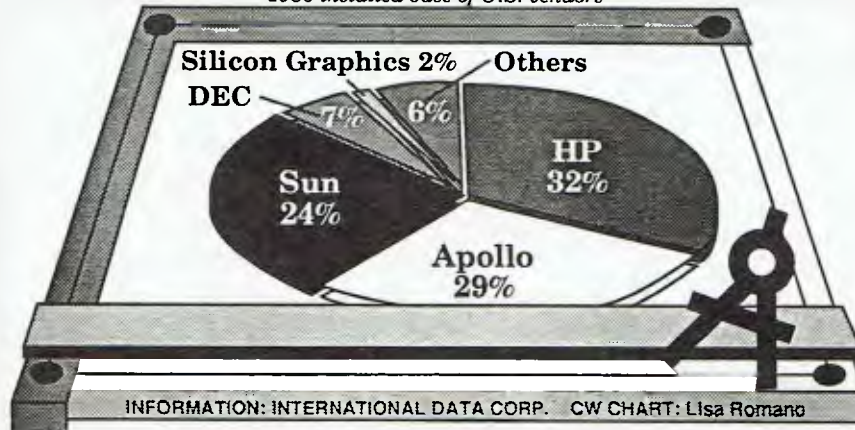
Today's system may not be fast enough to capture the pace of life, but hardware and software barriers are being broken down every day, thanks to ongoing research and development in industry and academia.

While Apollo, HP and Silicon Graphics develop their next-generation 3-D workstation products with the goals of speeding the number of transformations a second and the polygon fill rate, several other players are readying their own entries for the three-dimensional graphics race.

DEC is the most obvious possible vendor to next enter the market. The company is known to be working with Evans & Sutherland Computer Corporation, an interactive graphics supplier, on a 3-D graphics workstation product and is expected to introduce it by the end of the year. DEC currently has the fourth-largest installed base of technical workstations (behind Apollo, HP and Sun Microsystems) and recently unveiled an aggressive strategy for the low end.

In IBM's case, the question is not whether a 3-D workstation will be introduced, but exactly when. Both DEC and IBM have been slow to offer competitive workstations, but of the two IBM has

Presence in the worldwide technical workstation market
1986 installed base of U.S. vendors



the most catching up to do.

The Personal System/2 Model 80 lacks floating-point capability and graphics hardware assist, while the RT personal computer continues to be used more frequently

as a multi-user commercial system than as a single-user standalone technical workstation.

Sun, one of the fastest hares in the low-end workstation race, has been the un-

moving tortoise in high-end graphics contests. Just to enter this race, Sun must introduce a competitive 3-D workstation. It is a good bet, though, that the company has too much market savvy to pass up this opportunity.

Intergraph Corporation, which formally entered the technical workstation arena early this year with its Fairchild Clipper chip-based Interpro 32C workstations, will apply the graphics expertise garnered from more than a decade of being a DEC OEM.

One of Intergraph's strongest suits has always been high-resolution display terminals, which includes dual-screened systems that help in computer-aided mapping. Intergraph president Jim Meadlock has claimed that he can out-manufacture anybody, except perhaps IBM and DEC. No doubt he means it.

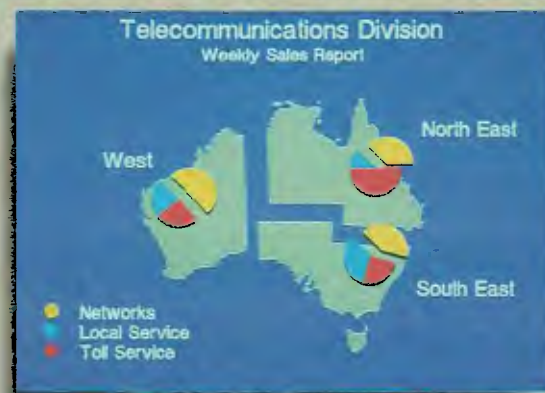
Later this year, Dana Computer and

(Continued page 4)

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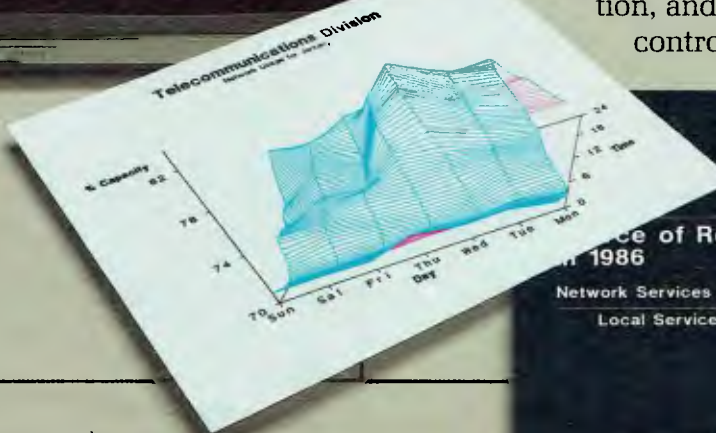
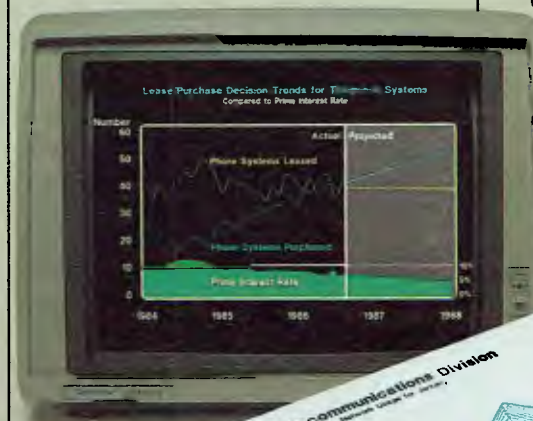
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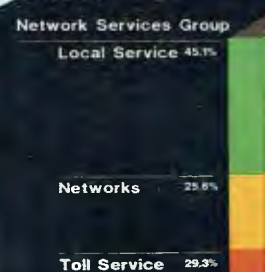


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Design images
move into 3D

(Continued from page 3)

Stellar Computer are both expected to introduce 20- to 30-million instructions per second workstations that have the computational performance of the mini-supercomputers already on the market and more than five times the graphics capability of today's 3-D workstation leaders.

However, if the price tags of these workstations turn out to fall in the \$US75,000 to \$US100,000 price range, as both companies' founders have said they will, then Stellar and Dana could be the industry's new Apollo or Alliant Computer Systems Corp/Convex Computer Corp in their establishment of new price/performance levels.

Even in early outline, the next wave of

3-D workstation products clearly demonstrates an ongoing improvement of the price/performance ratio.

The graphics capability first offered on technical workstations in 1982 and 1983 for \$US40,000 to \$US50,000 is currently available on the so-called lowend systems for at least one-third the cost. In today's market, it costs less than \$US18,000, for instance, to buy a fully configured Apollo Series 300, which includes a 19in color monitor, 1024- by 800-pixel resolution, a 4M-byte memory and a 155M-byte disk.

Although the same economies of scale apply to future products, the performance curve is increasing much faster today than it did in the early 1980s.

Today's three-dimensional graphics workstations are priced at \$US60,000 to \$US90,000. In mid-1988, it will be possible for users to buy three-dimensional systems that will provide more than five times the graphics performance for approximately the same price. Prices for workstations

that are less functional will decline sharply.

Technical improvements in graphics board sets, combined with the anticipated movement of terminal manufacturers such as Raster Technologies, into the graphics board business, means that personal computer users will soon have the ability to produce much more than business and presentation graphics on their machines.

Such hardware and graphics advances will make visual computing — the ability graphically to interpret, analyse and visualise information on a computer screen — an easily affordable reality.

More important for the long term, visual computing will enable the development of applications to meet needs that we cannot yet even begin to anticipate.

● Vicki Brown is program manager of technical computing research service at International Data Corporation in Framingham, Mass, and analyses Cad/Cam, technical workstations and other technical computing markets.

HP delivers a
color inkjet
thermal printer

UNDERCUTTING the price of pen plotters and offering faster output than color dot matrix printers, Hewlett-Packard has introduced a color inkjet device priced at \$A3271. The Paintjet thermal inkjet printer is said to produce a page of presentation-quality color graphics in four minutes.

Using an enhanced version of the same basic technology as HP's existing Thinkjet printer, the color graphics Paintjet device can print up to 180 dot/in, according to HP.

The Paintjet can use plain paper or a specially coated HP-supplied paper. The fast-drying HP paper, which costs 6 cents a sheet, controls dot size and circularity with the result that color output is more vivid than on plain paper.

Although Paintjet's resolution is only half the maximum dot density of Epson LQ-2500 color dot matrix printer and is inferior in output quality to high-priced pen plotters, its graphics are "highly acceptable" for most personal printer applications, according to one HP user who was briefed on the product.

One major US user said: "Being the first company to offer a printer with this particular combination of output quality, speed and price, HP will probably set a de facto industry standard."

HP is aiming Paintjet mainly at "experienced, multipurpose personal computer users", such as electronics designers, sales managers, product managers and financial analysts. Those users, HP said, have to produce a steady stream of professional-looking graphics for internal communications and need "brilliant colors to capture a viewer's attention".

At the heart of Paintjet's printing mechanism are two removable liquid ink cartridges. One holds 60 nozzles for squirting black ink on to 8- by 11-in paper and comes with a sufficiently large reservoir to produce 1100 pages of text. The other is equipped with 10 nozzles and contains enough yellow, cyan and magenta ink to yield 180 pages of color graphics.

At its highest resolution and brightest output, Paintjet is especially well suited for users who need to make overhead transparencies for inhouse presentations.

Paintjet is available for immediate delivery.

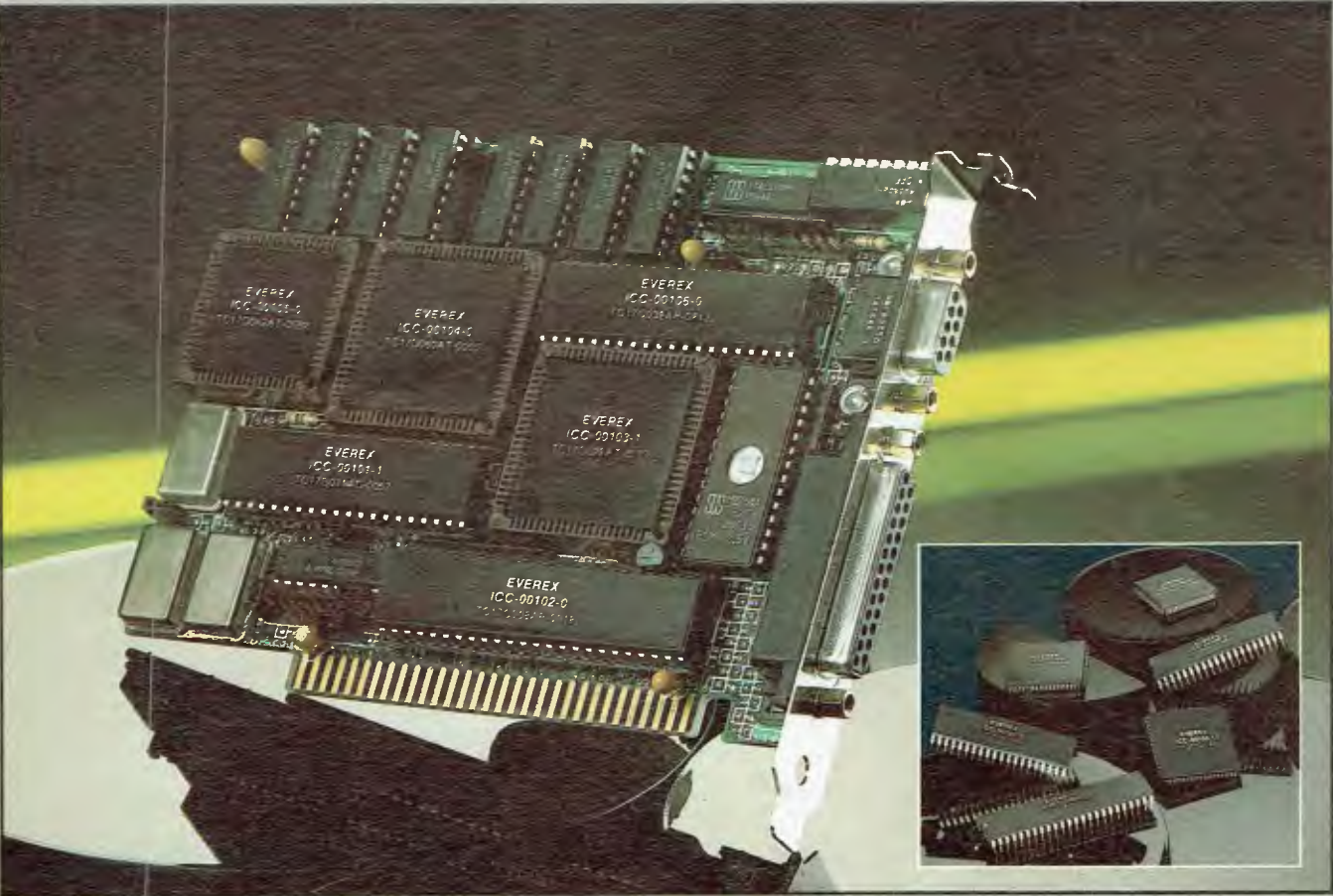
Graphics board on
the way from AST

AN IBM Video Graphics Array-compatible graphics board for IBM PCs and compatibles offers full register-level compatibility, according to its developer, California-based AST Research.

The AST-VGA also reportedly provides graphics compatibility with the Enhanced Graphics Adapter (EGA), Color Graphics Adapter (CGA) and Hercules graphics standards, enabling users to run existing EGA software now and higher resolution VGA software in the future. AST's VGA card claims a graphics resolution of 640 by 480 pixels with a choice of up to 16 colors from a palette of 262,144 and a 720- by 400-pixel text resolution in full color or monochrome.

The half-sized AST-VGA card is compatible with NEC's Multisync monitor and will cost \$US495.

AST also introduced the AST-3G Plus II, a half-sized card said to provide EGA, CGA, Hercules, IBM Monochrome and Printer Adapter graphics modes for the IBM PC and compatibles.



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	EVEREX MicroEnhancer Deluxe	PARADISE* Autoswitch 480	VIDEO7† Vega Deluxe	STB Multi RES-1
752x410 Resolution	Yes	No	Yes	Yes
Half-card	Yes	Yes	Yes	No
Parallel Port	Yes	No	No	Yes
Hercules on EGA monitor	Yes	No	Yes	No
132 Column Display	Yes	Yes	Yes	No

*Rev. 1.0 †Rev. 1.07 The above information as of 5/20/87.

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Graphics get down to business

BUSINESS graphics involves the use of symbols that relate to data within an X and Y, or two-dimensional space, or within an X, Y and Z, or three-dimensional space. Graphics used for business data fall into three general categories: charts, diagrams and maps. Charts are by far the most widely used, including such graphics as line charts, bar and column charts, or surface charts.

Charts are used to relate "how much" and "when", and are especially adept at conveying trends over time and tracking actual against planned results. Diagrams constructed for flow or organisational charts convey "how" a process should proceed or "who" is responsible. Diagrams tend to be a static representation of a process. Maps constructed for locations, demographic distribution, or to display the density of a product portray data by its spatial organisation and distribution.

These business graphics are used to represent a set of data spatially or over time. The best use for business graphics has been in analysis and decision-making for determining trends in large amounts of data or trends over time. Business graphics are also effective as communication aids. Graphics convey trends and condense analysis for shorter explanation times, and can be effective in maintaining the audience's attention.

In late 1984, the main impediments to the use of business graphics were the lack of database integration, insufficient user knowledge, and inadequate system integration. By early 1986 big advancements had been made in all three areas.

Mainframe links

Database integration is becoming less of an issue as more applications share file information between dissimilar software packages. For instance, most traditional presentation graphics packages can use Lotus data either by .PIC or .WKS files. More companies are entering into agreements for integrating structurally different but conceptually related software packages. There are intervening packages on the market today that will pick up a graphics file and integrate it with a word processing document.

Micro/mainframe links are also emerging as an important consideration for improving system integration. As more personal computers appear on corporate desks, there will be an increasing need to download data from the corporate mainframe database for reports or graphical presentations. And as the smaller networked system begins to dominate the office environment, the mainframe will be used increasingly as the central database. This reinforces the need for efficient file transfers between dissimilar software packages or database management systems. There are packages available that reside on both the mainframe and microcomputer hardware platforms.

The learning curve: There appears to be a long and gradual learning curve in adopting graphics. Most users need to be educated in the proper and most effective use of business graphics. For instance, when is the use of a bar chart more appropriate than a scatter diagram? It must be understood what the data is to represent (growth, comparison), what is the best way to represent it (line chart, pie chart), and what labels and annotations will clearly state what is being portrayed.

In many cases, too much data is

Integration with databases, monitor resolution and user interfaces are just some of the features of business graphics that have improved in the past couple of years. IDC researchers examine the burgeoning market

US Installed base of personal-computer-based business graphics software, 1985-1990, units (000)

	1985	1986	1987	1988	1989	1990
Integrated packages	1,636.0	2,451.0	3,429.0	4,602.6	6,010.9	7,700.9
Dynamic presentations	1.0	3.6	7.0	11.0	15.5	20.4
Presentations	413.3	627.0	926.3	1,345.3	1,890.0	2,598.2
Addon	47.3	94.4	150.9	218.8	300.2	397.9
Visual aids	27.8	34.1	41.6	51.4	62.2	74.1
TOTALS	2,125.3	3,210.1	4,554.9	6,229.2	8,278.9	10,791.6

SOURCE: International Data Corporation, 1986
Totals may not be exact due to rounding.

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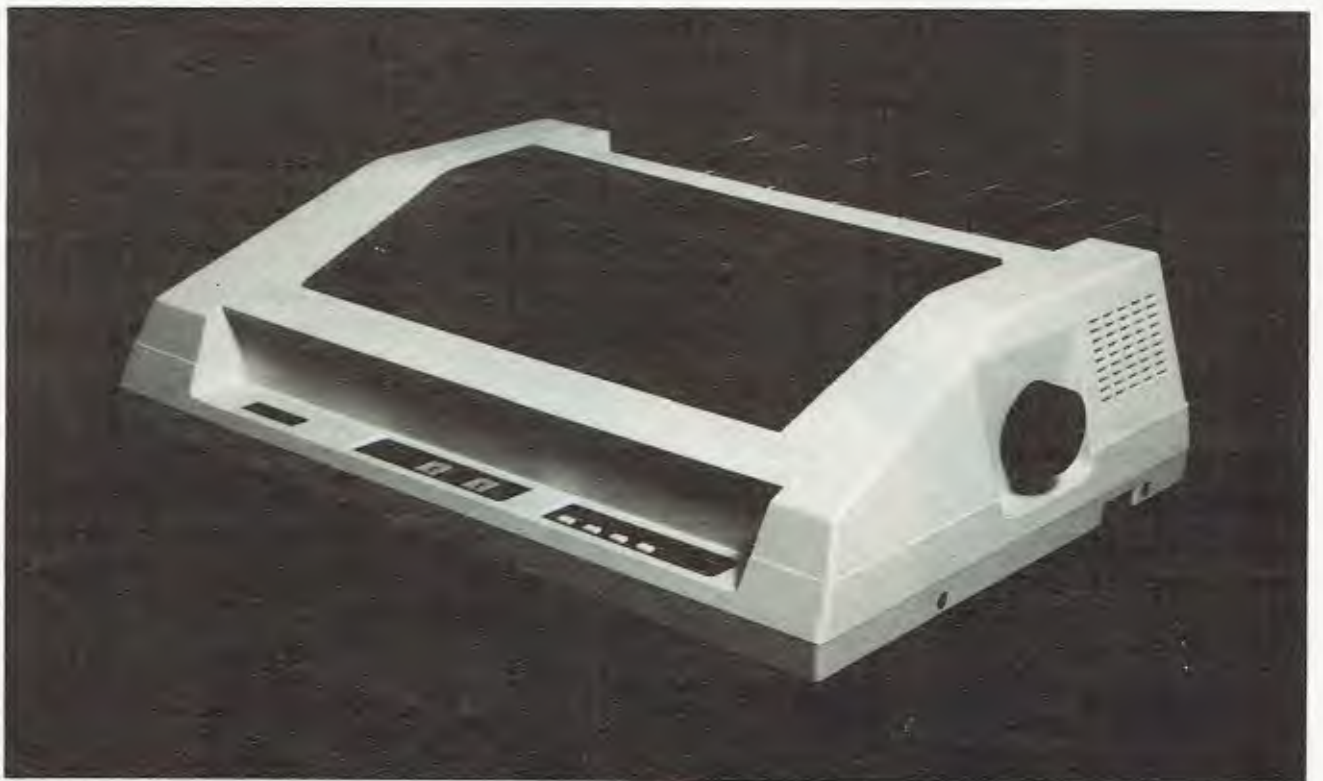
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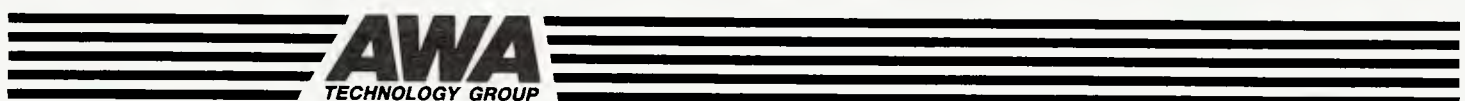
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represented in a graph. Some planning also helps in structuring research. If graphics are part of the research plan, it is wise to structure values and scales representing the data for easily constructed graphs and charts. Effective integration between a database, the business graphics application and a destination application such as a word processing document, decision support program, or artificial intelligence application needs to be developed.

A graphics program is too tedious to use as an isolated application. There is currently no one consistent means that will effectively integrate graphics with other applications. This type of flexibility and compatibility is becoming a very important requirement as more users become graphics literate.

The configuration problem: Display and output quality are also important considerations with the use of graphics. Most displays have the capability to display 780

Display quality is critical

x 350 (medium resolution) in monochrome at a reasonable cost. This represents a very large improvement over typical resolutions of 250 x 320 (low) that were common not more than two years ago. In considering color displays, there is usually a trade-off between resolution and price.

Color monitors are usually more expensive than monochrome, as are the graphics boards needed to drive them. A medium-resolution color monitor and graphics board may be priced the same as a high-resolution monochrome display. Finding the ideal monitor, graphics board and business graphics applications is a complex task with the large selection of products on the market today.

Definitions

The personal computer business graphics market can logically be divided into five segments as defined below:

1. Integrated packages (providing two functions): The integrated packages offer two types of functionality — a spreadsheet and graphics capability. This category is dominated by Lotus 1-2-3.

2. Dynamic presentation aids: This software can batch together graphs or images from graphics files and present them automatically. Functionality such as graphics editors, manipulation of the graphic objects making up a predefined image, screen capture and multiple fonts may all be included.

Depending on the tools provided and the creativity of the user, effective presentations can be created which approach an animation sequence. This process can be presented quickly enough that it actually can animate a sequence of slides. Training and presentations are the primary uses for this software.

3. Traditional presentation graphics:

The traditional presentation graphics packages include the functionality needed to create a wide variety of business charts. The graphics are presentation quality as opposed to peer or analysis quality. This can include multiple typefaces and fonts, color, various shading patterns, flexible annotation placement and axis manipulation, and placing multiple charts on a page. Packages emphasising mapping, such as Decision Resources' Map-Master program, fall into this category.

4. Addon packages: Addon packages are primarily object-oriented graphics editors which can be used to create a variety of graphics such as organisational charts, flow diagrams, logos and symbols. These packages are considered addon because their primary function is to enhance graphics from other less-flexible chart creation packages. Most of these packages are attempting to leverage sales from the Lotus 1-2-3 installed base by upgrading Lotus 1-2-3 graphs to presentation quality.

5. Visual aid packages: These packages include those that primarily provide the functionality needed to create either overhead transparencies or 35mm slides. The overhead transparency packages mainly provide tools for composing word charts. The 35mm packages generally have more functionality such as graphic editors and file capture utilities. They also provide the capability to send work done inhouse to outside slide-making outfits.

Constraints

Personal computer business graphics has been experiencing steady growth throughout the past few years. This growth, however, has not fulfilled the expectations of many predictions. There are tangible constraints affecting the growth of business graphics and graphics in general. Technology advances, however, and increased user interest are making the incorporation of graphics into more varied kinds of applications less difficult.

The first constraint, indirectly related to graphics but having a direct effect on the growth of graphics usage, is the disappointing turn in the personal computer market. The compound annual growth rate for personal computers used in business was predicted to be 52 per cent between 1980 and 1985 and has dropped off to only 11.7 per cent compounded annually from 1985 to 1990. The expectations and potential surrounding the personal computer market have declined significantly. However, current estimates are that only 20 per cent to 25 per cent of personal computers used in business are using graphic applications. This leaves a sizable installed base to draw upon.

Factors affecting business graphics in a positive way are the consistent decrease in the price/performance ratio of personal computer hardware. This decrease is due primarily to the decreasing costs of memory and chips in general. A typical graphics program requires 512K-bytes of Ram for a program to run compared with a spreadsheet program (Lotus 1-2-3) which requires only 128K-bytes. Bit-mapped monochrome displays also require additional memory; color displays require even more. The quality and quantity of hardware devices, graphic displays, and output devices are increasing, giving the user a better selection. Advances in technology and competition are directly attributable to improved selection.

General improvements in user interfaces and the increasing use of the Apple Macintosh and Macintosh-like interfaces, such as Digital Research's Graphical Environment Manager (Gem) and Microsoft's MSWindows, have given the use of graphics more visibility. These products have also emphasised the importance of the in-

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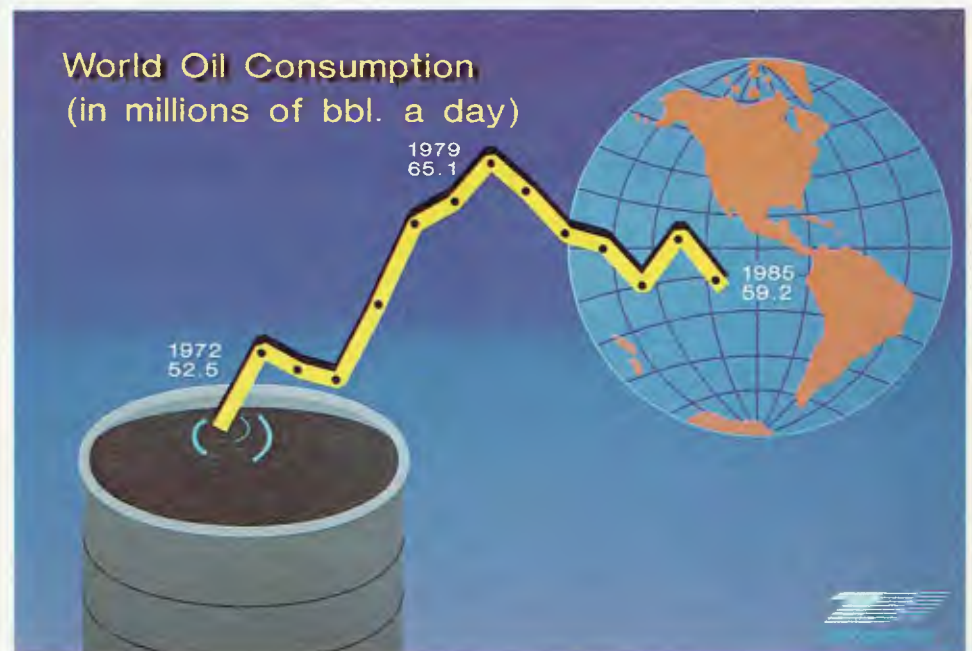
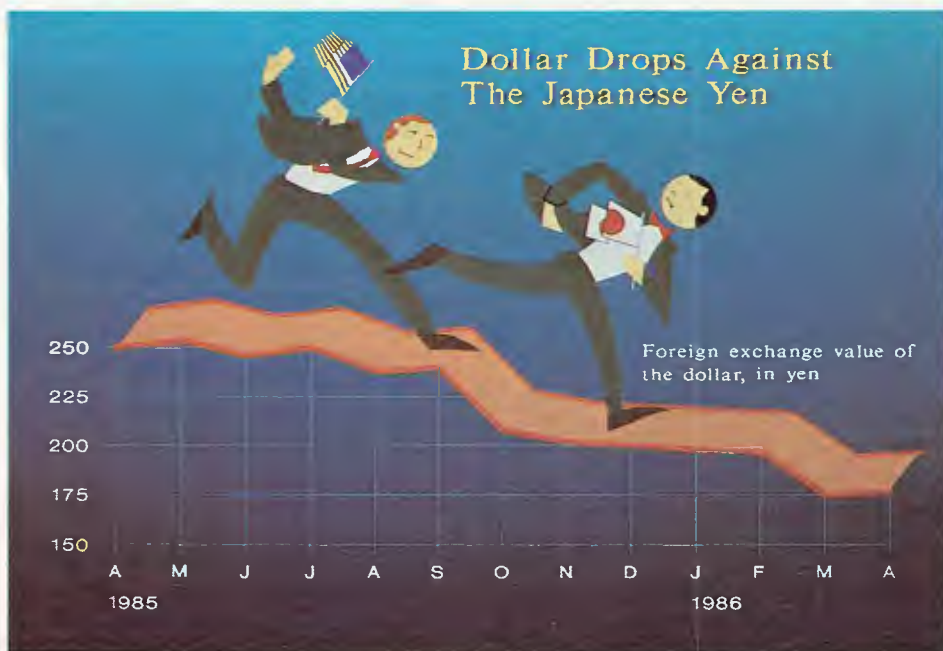
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((Continued page 8))

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(Continued from page 6)

tuitive user interface for those not fully comfortable with computers.

Personal computer business graphics also give the user a more cost-effective and easier means to create presentations compared with the large system business graphics package. The creation is left to one individual without having to coordinate with a central data processing department.

Large systems

The large system business graphics software market breaks out into three segments defined by hardware types:

1. Technical workstations: This segment includes software licences sold for technical workstations including DEC's Microvax II, Apollo Computer's 32-bit workstation series, Sun workstations, and Hewlett-Packard 9000 series workstations.

2. Minicomputers: This segment includes software licences sold on machines such as DEC's Vax 11/725 to the Vax 11/780

Interfaces have improved

US installed base for large system business graphics licences
1985-1990, units, by machine class

	1985	1986	1987	1988	1989	1990
Technical Workstations	117	517	997	1,621	2,432	3,568
Minis	6,465	10,125	14,151	18,378	22,817	27,478
Mainframes	8,427	13,714	19,530	25,927	32,644	39,697
TOTALS	15,009	24,356	34,678	45,926	57,893	70,743

SOURCE: International Data Corporation, 1986

Totals may not be exact due to rounding.

and Vax 8600, Prime 250 to 850, and Data General MV/6000 and MV/8000.

3. Mainframe computers: This segment includes software licences sold for machines such as the IBM 30XX series and IBM 43XX series and compatibles.

These segments were primarily determined by how the business graphics software vendors viewed the market.

Many of the same basic factors governing the personal computer business graphics market affect large systems as well. But

large system business graphics, as with most minicomputer and mainframe software, has a unique set of governing factors.

Generally, the overall increasing sophistication of users regarding graphics has helped large systems, as it has helped personal computers. Personal computers have had a positive effect on large systems in creating a somewhat competitive situation. PCs are becoming more powerful by virtue of CPU improvements and add-on board improvements. PC software is becoming increasingly competitive with large system software. Large system vendors are responding to this competition in part by improving their user interfaces.

Many packages offer multiple interfaces such as driving packages through command language as well as menus. Some packages, such as Precision Visuals' Pic Sure, have an interface building option, which can provide the flexibility to enter into vertical markets. This is a prime advantage of running on a large system — there is room and power enough for a variety of different options.

SAS Institute and SPSS, have leveraged from their installed base of statistical analysis base software. These two companies have had tremendous growth for their graphics packages (which also stand alone). This is a positive demonstration of the increasing sophistication of the user toward graphics.

Personal computers have also helped in training users to become more graphics intelligent. The transition from a PC to a large system for full use of the database management system and a graphics product such as Computer Associates' Tel-lagraph will not be as painful. Innovations in the micro/mainframe link connection will enhance this trend.

PC challenge

Use of the large databases stored on a mainframe is another plus for large system software. Large system business graphics software will be affected adversely by two primary factors. Personal computer business graphics software is becoming more powerful with added software functionality and added hardware capability. And with increased power in hardware, prices are falling. Large system vendors are beginning to meet this challenge by porting their functionality to PCs.

PC/mainframe links are another strategy where integrating or creating a link will give PC users the opportunity to use their PCs as well as tap into the large system or mainframe database. Integration with the micro/mainframe link is going to be an important area as more users begin to use this solution.

The technical workstation such as the Digital Microvax II and Apollo 32-bit workstation is creating a special problem, primarily for the minicomputer vendor and to some extent for the mainframe vendor. With regard to hardware, the minicomputer vendor is being squeezed by the technical workstations which offer a low cost-per-Mip ratio. Prices for software on the technical workstation are also required to be much lower but are capable of offering equivalent functionality.

A saving grace regarding pricing is that large system software is usually bought as a licence with renewal fees. These fees can range anywhere from 10 per cent to 75 per cent of the purchase price. Software vendors are perpetually collecting on their installed base.

The technical workstation phenomenon is going to result in a drop in sales of minicomputer software. Personal computer software growth is going to have an impact on minicomputers and mainframes. The mainframe will fare better than the mini because of its tremendous storage capabilities.

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No elaboration, just easy-to-read facts

BUSINESS graphics is no longer used just to produce pretty pictures, according to Jill Lord, assistant director, database and applications software section, Australian Bureau of Statistics. "Within our department the trend over the past few years has been to look at graphics perception," she said.

"The graphs must have some use, and for this reason we are not so much interested in producing graphs which look good, but graphs which provide useful information for the enduser."

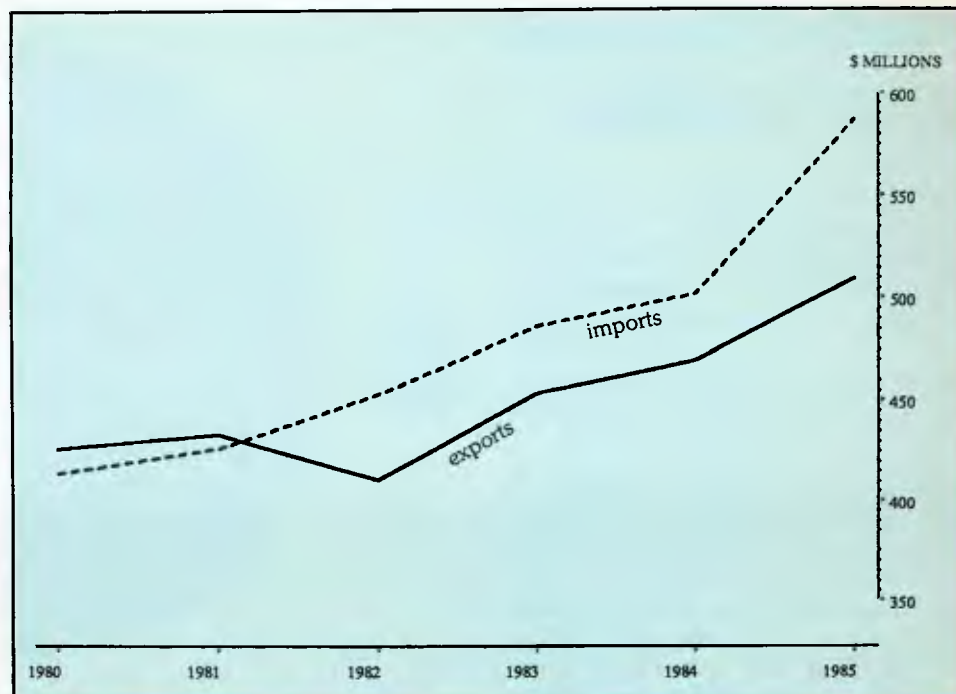
"I suppose most of our graphs look pretty uninteresting, but the number of users is growing as people can see the benefits of graphical information."

The Australian Bureau of Statistics uses several different graphics packages, including the microcomputer-based MS-Chart from Microsoft and Zenographics' Mirage from Dimension Graphics.

It is currently looking at purchasing several more copies of Mirage to be used specifically for the production of graphs for publications, and interactive editing applications.

CASE STUDY

The Australian Bureau of Statistics is a big user of graphics, and it aims for a very straightforward presentation of the facts. Robyn Hughes examines its philosophy



■ Comparison of rural exports with merchandise imports



● Robyn Hughes, consulting editor to Computerworld's Graphicsworld, is a Sydney-based freelance journalist specialising in computer graphics. She is chairperson of the NSW Branch of the Australasian Computer Graphics Association.

However, it is in the area of mainframe graphics that the database and applications software section has concentrated more of its efforts, working on developments to simplify access to graphical data for its endusers.

The computer environment consists of a Facom M382 mainframe at the ABS central office in Belconnen, ACT.

The mainframe is connected by dedicated land lines to offices in each State and the Northern Territory, and access is via a network of mainly dumb terminals.

Many types of graphics devices are connected to the Facom, including Tektronix 41XX series graphics terminals, Zeta 8 plotters, NLP6715d high-speed laser printers and Apple Laserwriters. The ABS also has numerous micros including Olivetti M24s and M28s, IBM PC XTs and Apple Macintoshes.

The ABS uses the OS/IV operating system, TSS (a Fujitsu version of TSO) and AIM (a TP system) for interactive execu-

(Continued page 10)

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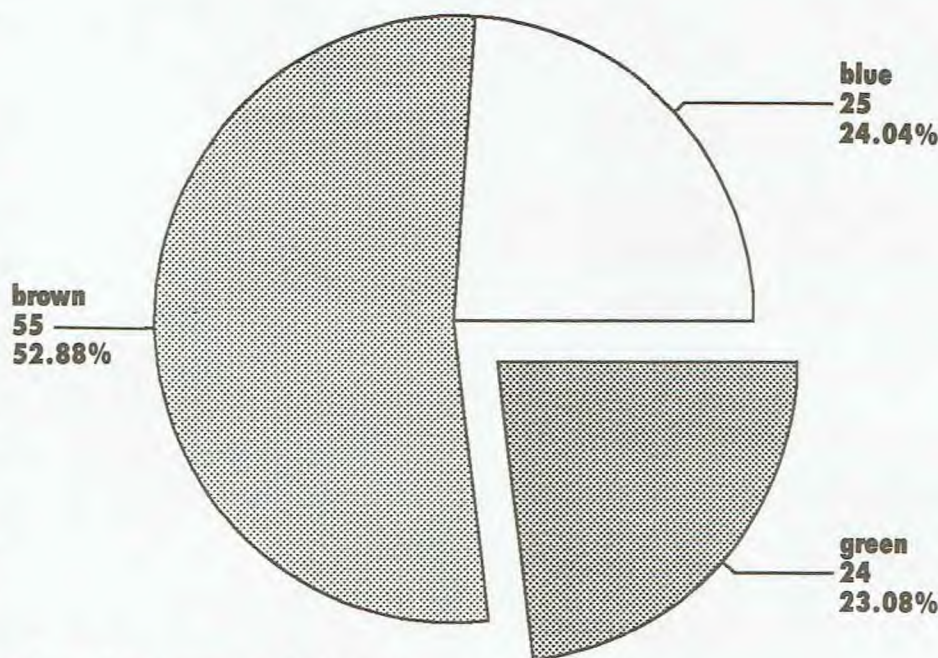
(Continued from page 9)

tion and JOL (a higher level version of JCL) for batch execution.

The main publishing packages used are TPL (Table Producing Language, developed at the US Bureau of Labor Statistics) which is used to produce tables; Natural which accesses Adabas databases and produces reports; and SAS/Graph which is used for charts and graphs.

The bureau was one of the first users in Australia of SAS/Graph, installing it as soon as it became available. It had originally installed other SAS software modules in 1980, because of SAS strength in statistical processing, the major ABS application.

Computer programmer John Moore said the system now runs between 2000 and 3000 SAS jobs each month. "We do not know how many of these are SAS/



■ Eyecolor of sample of ABS staff: sample size = 104

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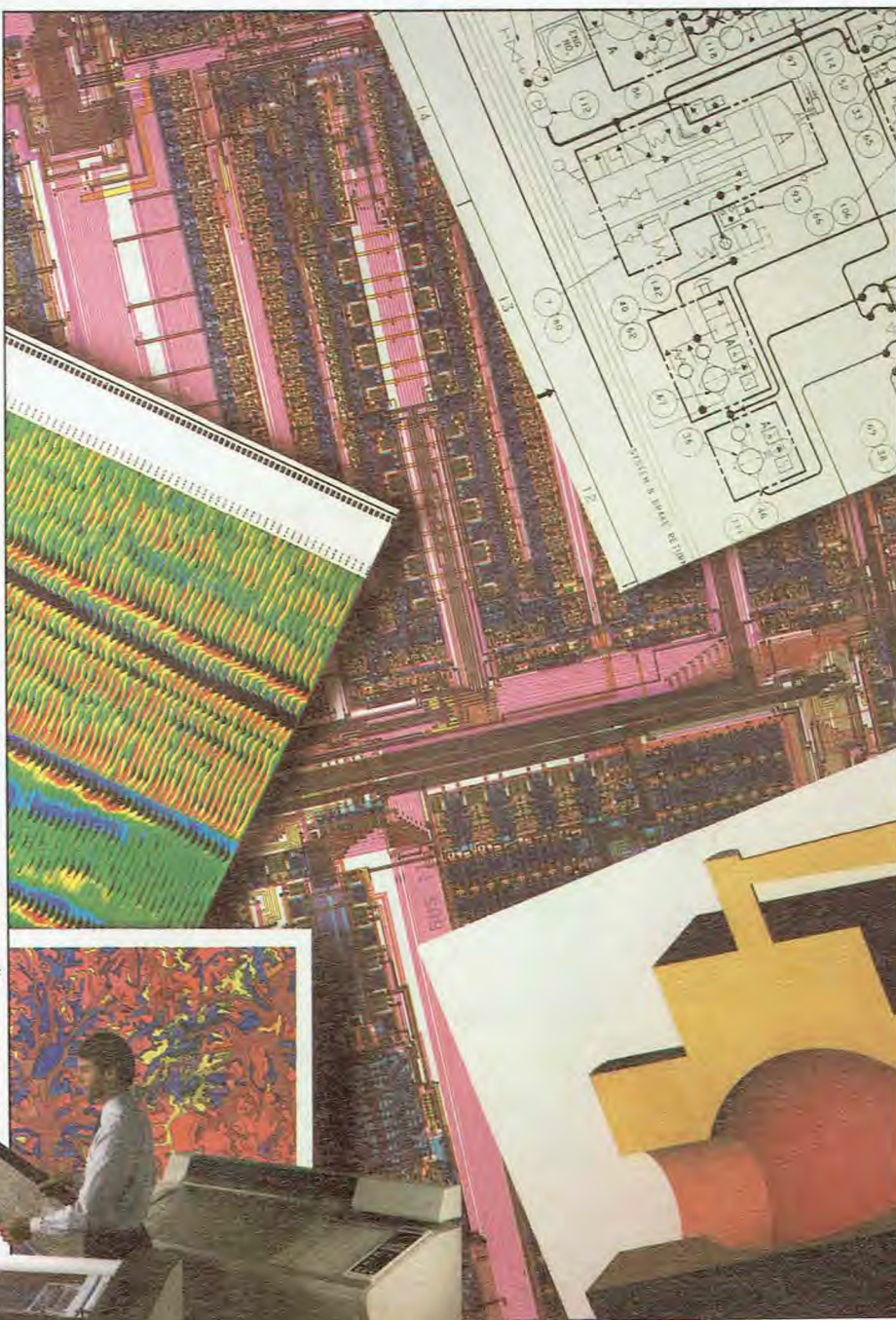
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Graph jobs," he said, "but we estimate that there are probably around 200 users of SAS/Graph within the ABS."

He also said the number of SAS/Graph users is increasing, due in part to the development work the section has done on the product. In particular, the development of an enduser interface, called Graphit, has made it possible for inexperienced users to produce graphics output easily from data held in SAS or Infos, the ABS' inhouse time series system.

"Graphit requires no knowledge of either SAS or SAS/Graph," said Moore. "It therefore allows staff to get straight down to work without the need for our usual training courses."

"Because of Graphit's strict adherence to ABS' graphics standards, the greenest recruit can quickly create the complex graphs and charts required for publication."

Moore said the ABS uses graphics for three major functions: data analysis; publications; and internal management requirements.

"Graphit is able to perform all three functions, therefore increasing its usefulness as a graphics tool," he added.

Data analysis involves using charts to check for trends, fluctuations and relationship in data held by the ABS. This may be either raw data from surveys or information processed by the ABS, such as seasonally adjusted figures.

Publications form a growing percentage of graphics output at the ABS — it is the second-largest publisher in Canberra. In the past, these publications did not include many graphics beyond tables, but in recent years this content has increased.

Bland

Graphics standards for publication graphs have been developed to ensure consistency in design, presentation styles and printed quality over the wide range of output.

"The standards are based on the principle that the primary aim of publications graphics is to give the facts, not, as is so often the case in the private sector, to promote a message," said Moore. "Output from Graphit may look somewhat bland to many viewers, but this is because it gives you the facts — it does not try to sell you something."

The third function of graphics at the ABS, internal management requirements, consists of such things as reports on resource usage (human, computer or monetary) and project management.

Moore said that Graphit consists of a large PL/1 program, SAS macros, TSS lists and JOL macros. "The PL/1 program captures user-supplied information from either commands or menus when used interactively, or from a command file when used in batch," he said. "The PL/1 program then checks the validity and the syntax of the Graphit commands and returns warning or error messages depending on the severity of any errors."

"Any SAS error messages are also passed on to the user at execution time; in batch they are written to the job log."

"Once the information has been collected and interpreted, one or more of a suite of SAS macros are called and expanded to SAS/Graph code to produce the graph."

Moore said that there are only six steps necessary for a user to produce a graph using Graphit.

"These include such things as choosing an output device, choosing the variables to be graphed, and choosing a graph type from a catalogue of over 110 graphs which includes pie, line, vertical bar, horizontal bar, scatter, dot and surface fill charts," he said.

"The whole process takes the user only as long as it takes to type in six lines of code. In other words, it is pretty darn quick!"

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■ The Boddington Gold Mine in Western Australia uses Australian Vulcan software

In the mining field, in particular, Australian graphics software has been very successful, writes Robyn Hughes

AUSTRALIAN graphics software companies have been working away quietly for some years now developing systems that are as good as, or in some cases better than, anything from overseas. And a wide range of applications areas are covered, from animation, through mining and engineering, to business.

In the mining field, in particular, Australian software has been very successful both locally and overseas. Companies such as Mincom and K Robert Johnson and Associates now lead the world in research.

In animation, production house XYZap led the way in Australia, achieving with its Vax-written software what it took Crays to produce overseas.

In engineering, companies such as Ceanet are developing civil/structural applications and selling the results abroad; in electrical engineering, ARC Cadcentre and Intergraph, have come up with some innovative programs from their respective original bases of UK and US software.

Chan Computing's software is probably the best known in business graphics, with The Magician, a micro-based offering from DR Research, about to be launched in the US by distributor Sourceware.

Lucrative niches

Many of our universities and research organisations, too, shelter groups of graphics enthusiasts whose work often leads to a lucrative market niche. Much of this is breaking new ground in areas which were thought to be the province of the large overseas companies with unlimited resources.

For example, in a project which has generated much excitement within the computer graphics community and is believed to be unique, NSW systems house Integrated Arts is building a system to handle all the post-production needs of an advanced video studio.

Specialist video hardware and the "box" for the system is currently being built at Integrated Arts' manufacturing premises in Zetland, Sydney, under the leadership of Tom Bishop, who has been described as one of the top digital engineers in Australia.

And up on the NSW Central Coast, at a site right on the beach, Integrated Arts has assembled a team of software engineers and researchers who are writing the software to bring the system together.

Integrated Arts was set up around three years ago by Kia Silverbrook, who formerly worked with Fairlight Instruments and was involved in the development of both the CMI and CVI marketed by Fairlight. He established Integrated Arts with the aim of producing a broadcast-based post-produc-

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(Continued page 12)

Home-grown graphics: good as anything from overseas

(Continued from page 11)

tion machine for 2D and 3D graphics. Although originally funded privately, the company was assisted earlier this year by a government industrial research and development grant of \$1.056 million. Funding has also come from two MICs, Techniche and Continental Venture Capital (CVC), which each now owns 5 per cent of Integrated Arts.

This funding is allowing Integrated Arts to build its own research buildings at Mount White, north of Sydney, and the hardware and software divisions will move there in December.

The company also raised another one million dollars by floating on the Stock Exchange, "just before the crash", according to software manager, Michael Seymour. He said it was planned so that employees got a large majority of the shareholding — over 80 per cent.

The listing was on the Sydney Second Board and Seymour said in spite of the crash shares have already gone up from 50¢ to 80¢.

Integrated Arts has a total staff of 47, 40 of which are involved directly in research and development work. Of these, there is a central software team of 20 picked from several disciplines within the computer and broadcast fields.

"Among them are users, including some with experience overseas on this type of system," Seymour said. "We also have editors, computer science graduates who have been involved in pure research, software engineers and some very good computer programmers who we have trained in video."

Totally digital

"It is an extraordinarily good team," he said. "They all inter-relate very well, and have the added incentive of being company shareholders."

The system being put together is totally digital, including four video digital paths, which Seymour says is quite unheard of in the industry.

Two major hardware components are being built: a "box" for handling the studio equipment, menu screens, input devices, and so on, with architecture based on parallel processing; and an accelerator which will provide "lots of grunt", mainly for customers wanting to use the system for 3D applications.

The software will have eight major components: realtime video digital effects; a digital paint system; full digital video mixer/optical effects; a titling system; an advanced computer editing system; a stills library; a 2D animation system; and an advanced 3D animation system.

"We have also built a lot of software engines and tools, and put the whole infrastructure in place," said Seymour. "And we are even running pretty close to schedule."

The system is expected to be completed around April next year, and Integrated Arts plans to launch it then on the US market, where it expects most of its sales.

"We plan to set up an office in Los Angeles and do our own distribution in the US," said Seymour. "The system will come in at around half a million dollars, and our market will be broadcasts, television stations and production houses."

"The major advantage our system will have over what is currently available is that everything is there," he said. "There are lots of other bits and pieces available on the

market, but we are the only ones to have put it all together in one system.

"Also, it is being built from an artistic point of view, instead of by engineers," he added.

The system will be totally integrated so that an operator, for example, using a normal edit desk, can call up the 3D system to produce fancy titles.

"Everything in the system is customisable," said Seymour, "which will mean that each production house will be able to make its system output look highly individual."

"There is, however, a large bank of pre-supplied effects built in for those who wish to use them," he said.

Smigs (Surface Modelling Interactive Graphics System) is another locally-developed graphics-based package which is expected to do well on the overseas market.

Smigs is a general purpose civil engineering design tool with particular application in the earthworks and road design areas. It was originally designed to simplify

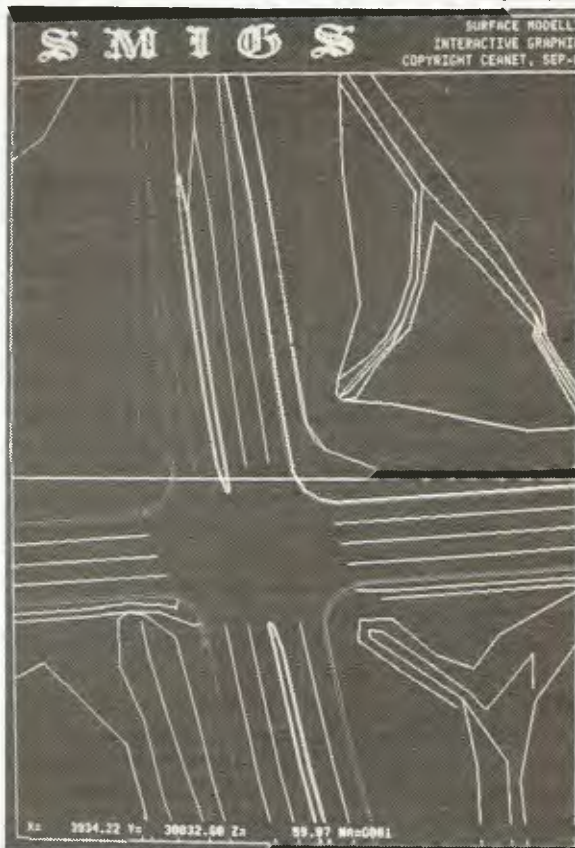
the creation and interactive checking and editing of string-based digital terrain models, but has been considerably expanded and developed into what is now seen as a comprehensive Cad package for 3D data.

Smigs was written by Ceanet, a company which specialises in technical computing applications, particularly in the engineering fields.

Ceanet's NSW manager, Dr Lee Gregory, said that Smigs is expected to do well in the US and Europe because there is no equivalent product on the market.

"We are in the process of setting up distributors in both places at the moment," he said. "The fact that the software is string-based has created much of the interest."

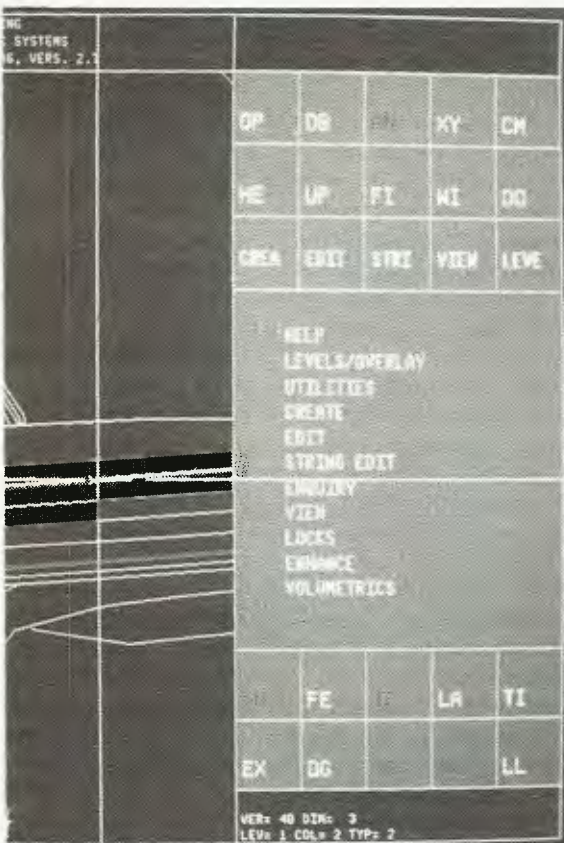
Smigs' first formal outing in the US took place at the 29th International Meeting of the Highway Engineering Exchange Program held in Iowa in early October. Mario Sanguinetti, applications consultant with Ceanet, presented a paper on Smigs which created a lot of interest.



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Sanguineti said because Smigs is designed for quick and efficient manipulation of large amounts of data, it is particularly suitable for use in today's civil design projects.

These collect and record large amounts of data including spot heights, contours, sections, features, horizontal alignments and text.

Smigs uses fully interactive graphics as well as numerical input to provide direct access, interrogation and manipulation of this data, using a mouse and an onscreen menu system.

Sanguineti said civil design programs are often based on traditional Cad software, but many of their functions and facilities are superfluous for the task.

"A further disadvantage of applying Cad systems to civil design projects is that Cad macros are built on top of the existing system, which has the effect of vastly reducing speed performance," he explained.

"In a string-based system, the subjects, such as terrain, are modelled by lines con-

necting a series of points and these lines are termed strings.

"The points of a string may have the same Z value, as in contour strings, or may have varying Z values, as in ridge lines.

"For defining such things as the centre line of a road, a more complicated string is required which takes into account the arcs and spirals used in the centre line definition," he said. "Points may also need individual text labels as well as an overall string label.

"Although this extra information can often be implemented in a Cad system by use of tags and databases, the need to be constantly referring to these additional properties in most civil applications overloads the system."

Smigs is written in standard Fortran 77 code and currently supports Apollo workstations, Sun workstations, Vax workstations, HP9000, Prime, IBM RTs and Cyber machines.

There are already around 15 sites in Australia, with the latest sales to Campbell-

town Council, Capricornia Coal, Pancontinental Mining, and Adelaide engineering consultancy, Dane, Sutton and Clark.

One of the earliest Smigs users was the Department of Main Roads in NSW. The DMR has been using Smigs for over a year to edit digital terrain models in its photogrammetry section.

According to the DMR, Smigs has allowed a considerable time saving in the production of these models. Currently, it is using Smigs to digitise information for the planned Gore Hill Freeway, which will run across some of Sydney's northern suburbs between the Pacific Highway and the Warringah Freeway.

With Smigs, the DMR will be able to merge field and photogrammetric surveys, and produce accurate maps of the area for the freeway design.

Another successful product based on a string data structure is Surpac, a suite of software for mining industry applications, written by Perth-based Surpac Mining Systems.

The company was established five years ago and began development of a package which aimed to integrate all mining operations from surveying and geological studies to mine planning.

The original software was written for Western Mining on a Vax and Surpac has since developed versions to run on IBM ATs and upwards, and compatibles, HP 9000s and Data General equipment.

Company director Graeme Brew was one of the two founders of Surpac. He said there are now around 120 installations of the software worldwide, including sites in New Zealand, New Caledonia, Canada and the US as well as all around Australia. Surpac was launched on the US market in August last year, at the Las Vegas Mining Exposition.

Good response

"We went over with an Australian delegation," Brew said, "and the response to the software was so good we left our engineer there to have further discussions with interested parties.

"The result was that we now have a US agent who has already made two sales — including to the Colorado School of Mines, which is using Surpac for teaching purposes, like the School of Mines at Ballarat CAE is doing," he said.

"Our product is different from others on the market because it is based on a simple string data structure which is used for all data recording and modelling. A string editor allows you to display your string data in its raw surveyed form or in its final joined string format.

"The program allows you to zoom in on any area and identify any point on the display," Brew continued. "Data points can be moved, added and deleted, axes can be positioned and data from different database layers can be overlaid."

Use of a common string data representation allows the integration of surveying, geology and mine planning functions.

"For instance," said Brew, "it is possible to produce composite maps showing geology, survey and mine planning data, enabling professionals in each discipline to easily access the findings of the others."

Surpac is in use in applications for gold, coal, iron ore, base metals and diamond mines, for both surface and underground mining, and in the exploration, design and production phases of operations.

Brew sees some of its most important features as being the ability to design open cut pits with variable slope parameters and automatic haul ramp design; the ability to simultaneously display and manipulate unlimited different layers of data; section and DTM displays to confirm volume computations; and the cartographic plotting module which allows user control of data presentation and overwriting on plans.



Merry, Trevor, Deborah, Paul, Cathie,
v, Bob, Graeme, Mullar, Sharon . . .

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The choice of graphics package was crucial for CSR — over 8500 visuals are produced each year at 15 locations

AS one of Australia's largest corporate enterprises, CSR has operations which extend far beyond the sugar industry. With activities in building products, coal, minerals exploration and development, oil and gas, as well as sugar, the effective flow of information plays an important role in its corporate efficiency.

CASE STUDY

The company's policy of sharing software with substantially common purposes with CSR, gives benefits including the transferability of skills and communication between specialists and software users in difficult locations said CSR's George Sinclair, manager, business systems in the sugar division. He was previously chairman

How CSR sweetened demand for visuals

of CSR's business graphics evaluation committee.

Mirage software by Zenographics, distributed in Australia by Dimension Graphics Pty Ltd, was selected by CSR as its corporate business graphics standard about three years ago.

At the time and because of increasing interest in this area, an inter-divisional group was formed to examine software packages which might suit CSR's requirements for its mainframe computers and to select the most effective product.

"Many packages were dismissed — not necessarily because they were not good,

but because we had other requirements in terms of our hardware," Sinclair said.

"DEC is the predominant hardware brand within the company but we do have others and it is very difficult to get one software product which can run across the full range. Mirage met one of the criteria in that it ran on multiple hardware types — Vax and Prime."

In the course of indentifying that there was a need for graphics software, it was estimated that roughly 8500 visuals were being produced by the company each year — most manually.

"We were quite surprised how many

graphs were being produced on a regular weekly, monthly, six-monthly and yearly basis," Sinclair said.

"On the basis of various research articles, we found that there would be a general productivity improvement in the production of graphics by the use of automated tools."

The visuals were being produced for a number of purposes including CSR training programs, management seminars and external presentations. Much of this work involved the routine production of updated graphs based on new data.

"The initial development time for graphs is probably not much greater doing it manually than by using a software product," Sinclair said. However, the benefit of using Mirage is that standard graphs produced regularly are brought up to date simply by putting in new figures and running it again.

"This is where the real productivity gain comes in and was one of the justifying reasons for acquiring Mirage to produce our graphics" he said.

The Business Graphics group identified some of the intangible benefits from the use of software for graphics production as being consistently high quality of result, quicker interpretation, more accurate graphs and consistency of style. This produces more professional appearance in the presentation of data — and more effective communication.

Faster production

Sinclair said that one of the attractions of Mirage is the Graphics Editor, which allows freehand application and is used extensively by CSR technical personnel.

Complex charts, diagrams and logos become possible with the Graphics Editor by giving the user the ability to draw lines, polygons, curves, boxes, circles, text, and arrows and so on. Visuals can be manipulated in a variety of ways either individually or as a group.

Having a graphics terminal with a plotter, for the production of hard copy for presentations in CSR business activities around the country, means that the production of communication graphics is much faster and has resulted in more effective communication of data.

"In the event of a user problem, there is a resource of skill available through having standard software, as well as normal transferability of data," Sinclair said.

With the software package being used on mainframe computers in upwards of 15 locations, arriving at the right choice was obviously very important.

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an even faster one. This means your computer can drive a 5800 as simply as a pen plotter without any of the overhead normally associated with an electrostatic plotter.

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Free software from Autodesk

AUTODESK Australia Pty Ltd has announced that it has set up a one million dollar grant program in Australia.

Tony Zammit, director of Autodesk, said: "The grants are modelled on a similar program set up in US. They will take the form of software including Autocad, Autoshade and Autosketch packages."

The grants will not be limited to government-funded bodies. Private individuals, students, teachers, institutions, R&D groups are among those eligible.

In order to be considered for a grant, registration of interest in writing must be lodged with Autodesk. The company will then forward an application form and conditions of entry. Applicants will be asked to provide an outline of their current and projected Cad needs and skills, and a brief summary of how and when they would put the software to use.

Are minis going out of fashion?

IS the traditional minicomputer dead in the graphics market? Judging by all the vendors, the swing is certainly away from minis and on to the ubiquitous PC and its up-market brother, the workstation. This will certainly hurt the conventional terminal marketplace. Various US predictions show that of all the areas of computer graphics that of the terminal has the lowest growth rate.

The big money is being poured into workstations with Apollo and Sun being the volume market leaders. However, these two companies have to look out for the perceived smaller machine taking a chunk out of the bottom end of their marketplace.

According to Scott McNealy, Sun's president, \$US15 million is going into Sun's research and development. Impressive as this investment may seem, Michael Homer, manager of business development at Apple computer, said: "We have \$US180 million for R&D this year. If we were interested, it is likely we would do well in graphics, and we are interested."

Apple is aiming at two new markets — desktop engineering and desktop presentation. The presentation flows naturally from its early lead in desktop publishing; the engineering makes sense given the open architecture and graphics user interface.

Addin boards

The Mac II is the first PC to use the same 32-bit processor (68020) and floating point processor (68881) as the second generation workstations. And the Mac II finally supports color, and has expansion slots for addin boards. This has led to a growth in the number of vendors of addin boards for the Mac, with high resolution graphics card available from several suppliers.

Color film recorders and plotters are all supplied from the established vendors such as Matrox, Calcomp and HP. Color software for Cad, publishing and animation are increasingly being ported to the Mac.

The PC market is not being left behind by this enthusiasm for the Mac; there are many more vendors of PC addons, because of the open architecture and the clones.

Sophisticated graphics cards exist with high resolution, some up to 2000 lines some with as many as 16.7 million colors which allow the user to produce a realistic shaded image.

However, perhaps the key benefit of these boards, which is only just being realised in Australia, is their speed. If you have ever watched Autocad draw on a lowend card the time to zoom and/or pan means that anyone using the system in a real environment spends an awful lot of his so-called increase in productivity, merely watching the screen redraw.

The introduction of the new graphics chips from Texas Instruments and Intel give raw computer power of the order of five Mips, and the large memory, as much as eight M-bytes, means that images can be retained in the board and locally manipulated.

In the high profile desktop publishing business, graphics boards are capable of 100+ dots/in on the screen and many have the capability of storing fonts within the board, ensuring a much faster display of the page.

After all, people actually buy systems so they can get the work out faster and more efficiently, so speed is very important.

In the area of resolution, Hitachi has prototyped the HM-6219 color monitor

which features a resolution of 2048 x 2048, over four times the density of what is currently considered high resolution.

One of the highest predicted growth areas for computer graphics is in artificial vision; in its crudest form this means getting images into the computer. In the past this has been the preserve of highly sophisticated and expensive equipment, such as that used for satellite sensing or in the print industry.

The advent of relatively high-powered desktop computing has brought a whole new breadth to imaging work. The desktop publishing wave is now learning the value of pictures and diagrams. Scanners are now available from as low as \$3000, and Howtek has introduced its Scan-

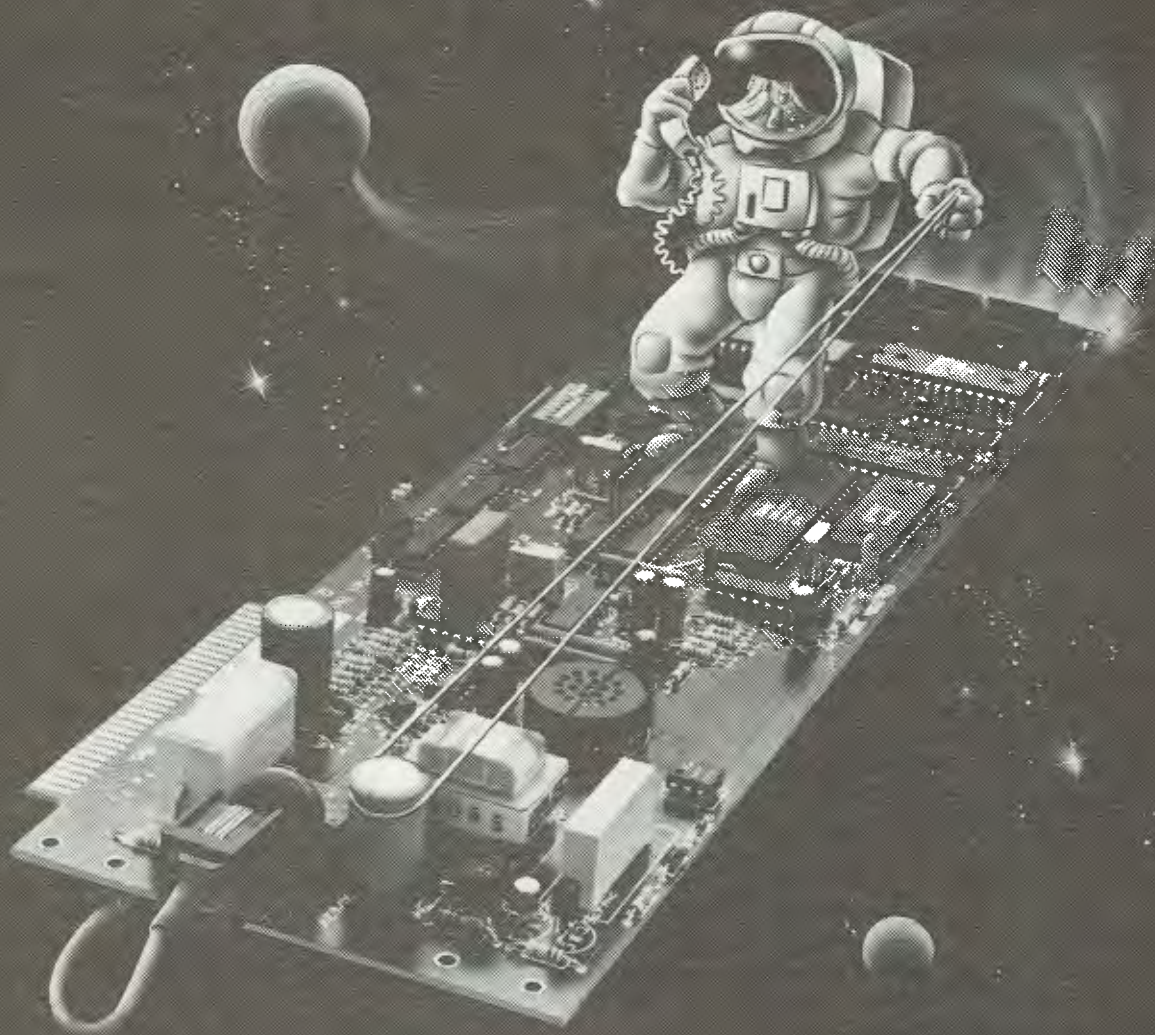
(Continued page 16)

For graphic applications, the trend is away from minis and terminals and towards PCs says Mike Barraclough



● Mike Barraclough is marketing manager for the TCG Group

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Siggraph offered the chance to view upcoming products

IF TRADE shows offer glimpses into the future, Siggraph, the meeting of the Association for Computing Machinery's Special Interest Group on Computer Graphics, can be thought of as providing a very clear picture of a computer graphics future marked by high performance, high resolution, and continued price erosion.

Among PC graphic cards, resolutions of 1,600 by 1,280 and higher and screen-drawing speeds of up to 100,000 vectors/sec were the major breakthroughs at the Siggraph show. At these high speeds, Autocad drawings no longer trace on the screen; instead, the drawings pop up.

Developers credited optimised chips with the performance boost. The Intel

82786 graphics chip is the choice of Quadram, Univision Technologies, Number Nine, Verticom, Taxan Corp, Bell Technologies, and others. Matrox, one of a handful of companies showing graphics cards based on the Texas Instruments 34010 graphics processor that was also championed for high performance, showed its PG-1281, which features 1,280-by-1,024 resolution and the capability to draw up to 100,000 vectors per second on-screen.

High performance also came from proprietary video processors. Metheus developed its own chip set for a \$US1395 card that the company claims produces graphic performance usually found only in cards that sell for about \$US2500.

Most monitors displayed at the show, although not new, showed a trend toward increased resolution and faster scan rates.

Mitsubishi, NEC, and others showed color and monochrome monitors, while Monitronix Corp introduced the MX-4190, a 19-inch, 1600-by-1280 resolution monitor with a 200-MHz bandwidth.

Three-dimensional graphics achieved with a special polarised shutter (called the Z-screen) that fits over a monitor, were shown by Stereo Graphics Corp.

Calcomp, Mitsubishi, QMS, Panasonic, and others demonstrated color printers with thermal transfer techniques. Also, Tektronix showed behind closed doors its 300-dot/in, four-color thermal printer, which produces an 8-by-11in page of graphics in 65 seconds.

JDL Inc, demonstrated its color JDL-850 GL+ plotters, which plot 3-D images in hard copy of 18 by 24in. The product supports shading, dithering, and

other tasks that are required by engineers performing 3-D modelling. It features a 1M-byte plot spooler and an automatic paper feeder. The JDL-850 GL+ plotter sells for \$US3845.

Barco showed a line of large-screen projection units that permanently mount to a ceiling and project images on to a wall or screen. According to the company, the larger video tubes produce brighter and sharper pictures. Other Barco models include a portable rear projector and remote control operations with automatic scan rate adjustments.

In its continuing effort to position the Mac II in the engineering market, Apple Computer showed such third-party products as a Macintosh version of the Versacad Cad program and several color monitors for the Mac II.

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Are minis going out of fashion?

(Continued from page 15)

master, which enables full color images to be stored in the computer. The price here should be about \$12,000.

Matrix has recently announced a presentation system to be used in such places as point-of-sale displays and information kiosks, as well as the more mundane business presentation tool.

The system has many of the features found in video recorders, such as infrared remote control and an inbuilt speaker. A video and sound digitiser enables the capture of photographs and sound clips. A genlock feature enables the merging of computer generated graphics and live video.

Several companies are offering the capability to incorporate pictures into databases. Pictures can be captured in many ways — low-cost video camera, Fax, video or compact disk.

This ability to store pictures opens up a whole new area of picture libraries. Examples of their use are in personnel files and real estate, and the Smithsonian museum has a truck which goes around the country capturing images of private art collections.

New dimension

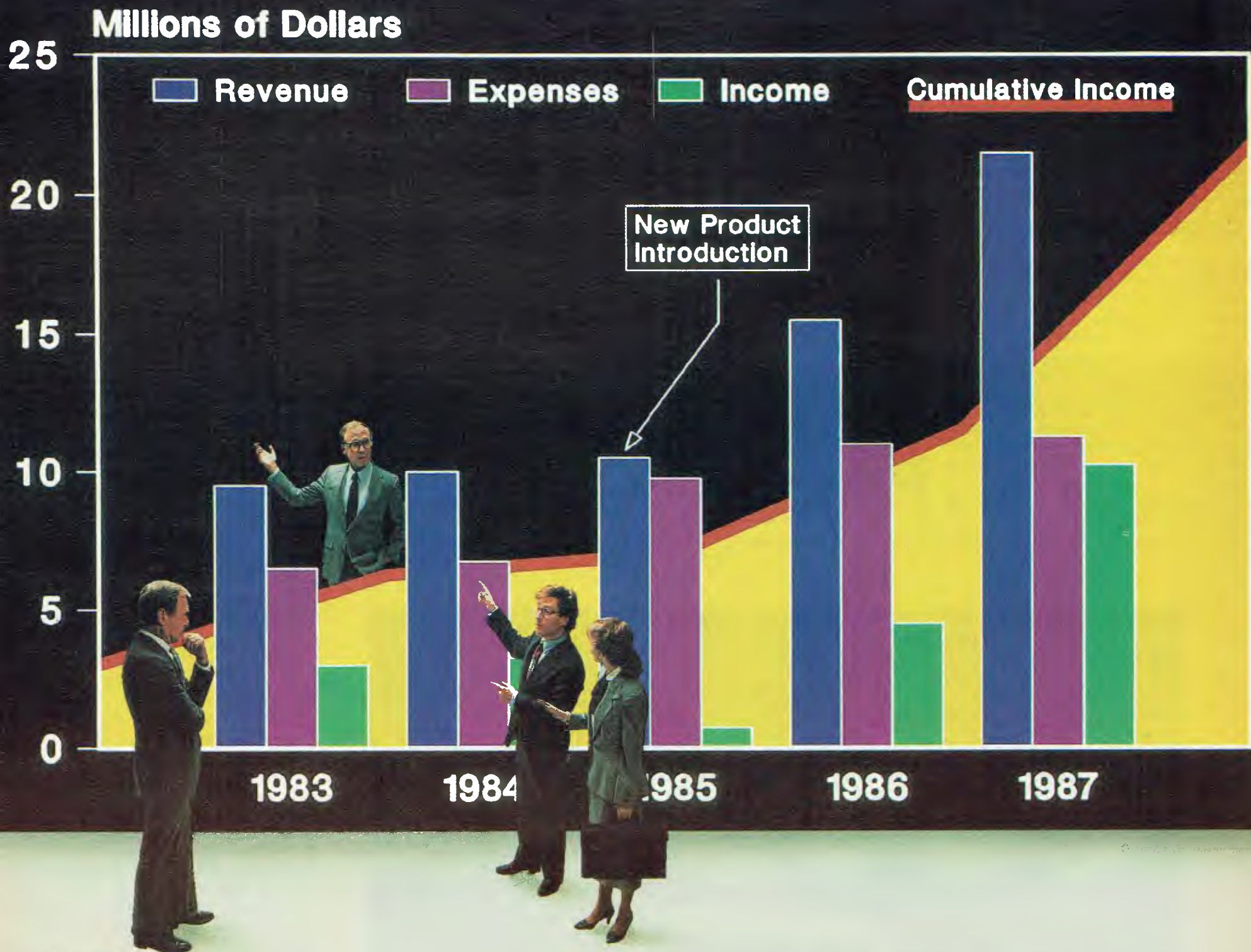
One of the most requested features in people's wish list for computer graphics is to move to 3D. Just as people gained more information from looking at images in color, so a recent report by the prestigious Frost & Sullivan consultancy said: "The greatest single improvement in image understanding will take place with the advent of real-time 3D vision".

It points to 3D medical imaging as a "highly promising" technology that should help curative procedures such as laser surgery. However, F & S warns this 3D technology receives scant R&D attention.

There are two small companies in California, both with stereo systems. Their technique is to create a stereoscopic pair of images on the screen; each image is then alternately presented, using a high refresh rate of some 120 frames per second.

Between the viewer and the display is a liquid crystal shutter enabling one image to be alternately turned off to one eye. The use of high refresh rate ensure that no flicker occurs.

Applications for this are being found in engineering design where a team can view a new design without the expense of building a model.



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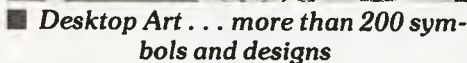
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Dynamic Graphics Pty Ltd, 36-38 Parramatta Rd, Glebe, NSW, 2037. Tel: (02) 660 0211.



Autodesk has also reduced the price of Autosketch from \$A350 to \$A160. This

ECS Pty Ltd, 1155 Malvern Road, Malvern, Vic 3144. Tel: (03) 209 9135.

Dimension Graphics Pty Ltd, IBIS House, 201 Miller St, North Sydney, NSW 2060. Tel: (02) 929 5855.

Software Suppliers Pty Ltd, 7 Avon Rd, North Ryde, NSW 2113. Tel: (02) 888 1955.

Intergraph Corporation Pty Ltd, 55-61
Talavera Road, North Ryde, NSW 2047. Tel:
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UPDATE

Workstation will run
all Applicon packages

APPLICON Schlumberger has announced the Applicon 4790 workstation, for Cad/Cam/Cae users. Based on the Microvax II, the workstation is standalone and will run all Applicon software such as Bravo 3, a fully integrated suite of drafting, solids, 3D modelling, finite element modelling, 2D/3D mechanisms, NC machining/fabrication and also PCB and VLSI design packages. It is priced from \$80,000. Also launched is the Benson 3036 color electrostatic plotter.

Schlumberger Systems Pty Ltd, 382 Wellington Rd, Mulgrave, Vic, 3170. Tel: (03) 560 1166.

Bit-mapped graphics
terminal from C&PA

A QUME bit-mapped graphics terminal has been released by C&PA. The QVT 212GX terminal accommodates the full spectrum of business, engineering and scientific graphics, as well as alphanumeric text editing applications.

This raster scan terminal is compatible with DEC's VT100 and Tektronix 4010/4014 terminals and runs Plot 10 graphics software, as well as conforming to Ansi X3.64 standards in the text mode. C&PA Corporate Pty Ltd, 25 Hardner Rd, Mt Waverley, Vic 3149. Tel: (03) 544 4933.

HARDWARE

Color Cad display system

TCG, the Australian distributor for Greyhawk Systems has introduced an electronic display system which renders full color A1-size Cad drawings in under one minute. The Softplot 2122 targets the mechanical Cad and Cae markets where large-scale, interactive plotting of drawings is required. The system allows drawings to be archived electronically and minimises the amount of time and materials wasted when designs are reviewed and altered by conventional methods. Further applications are envisaged in the printing, manufacturing and defence sectors, solids modelling, seismic data and VLSI design.

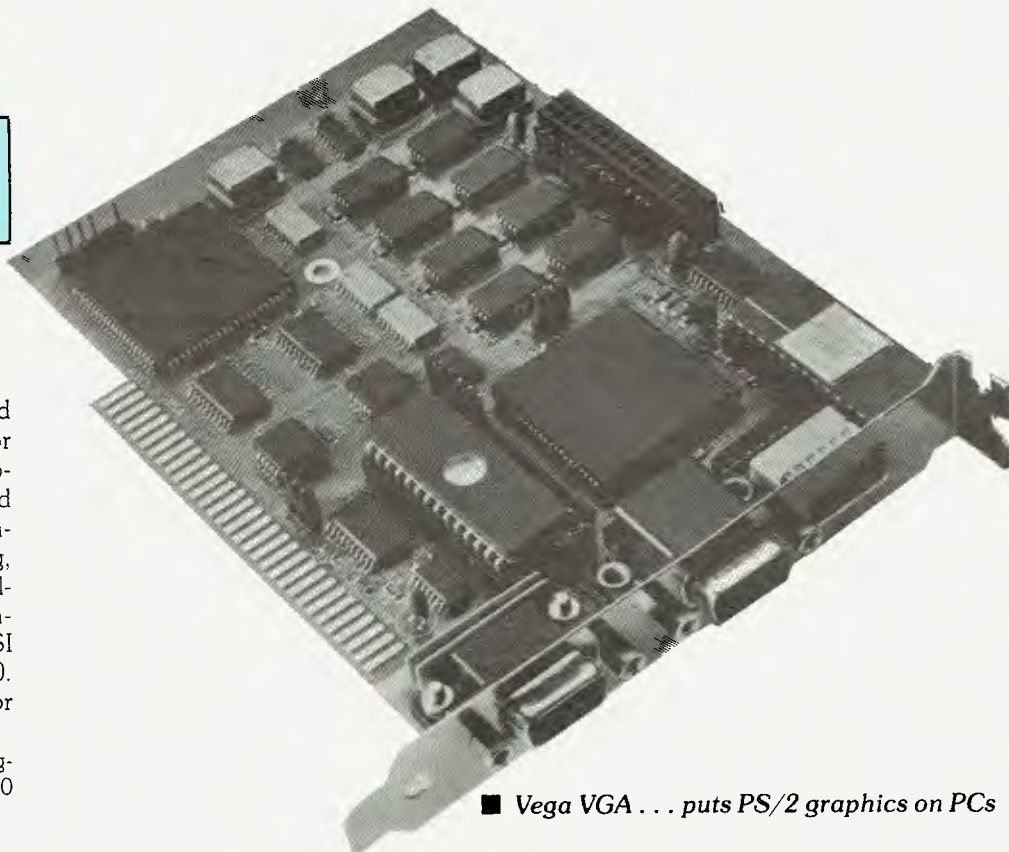
Pen plotter emulations are HP-GL, Calcomp 907/PCI and Calcomp 960. The software packages supported are Cadcam Red-Line, Computervision Red-Line, Plot 5080 and ISPC.

TCG Systems Automation, 30 Balfour St, Chippendale, NSW 2008. Tel: (02) 699 8300.

Graphics co-processor

DATAMATIC has announced the availability of the Metheus 1104 Advanced Graphics Co-Processor for professional PC-based graphics applications. The 1104 is a compact half-height card offering displayable resolution of 1024 x 768 x 4 bit-planes. 960 x 600 resolution Color Graphics Adapter (CGA) emulation for both graphics and text is also offered. Applications such as Autocad, Versacad, Cadkey, p-Cad, Gem and Windows will operate without modification on the 1104. List price for the new board is \$A2780.

Datamatic Pty Ltd, 9 Byfield St, North Ryde, NSW 2113. Tel: (02) 888 1788.



■ Vega VGA . . . puts PS/2 graphics on PCs

Array adapter brings
PS/2 abilities to PCs

DIMENSION Graphics has released Vega VGA, a high performance graphics array adapter that is claimed to bring the graphics capabilities of PS/2 to IBM PC and compatibles. When used with a variable frequency digital monitor, it produces a resolution of 640 x 480 pixels and an additional high resolution 800 x 600, both with a choice of 16 onscreen colors from a palette of 64.

When used with an analogue monitor, Vega VGA supplies a palette of 262,144 colors, of which 256 may appear simultaneously on the monitor at a resolution of 320 x 200 pixels and 16 simultaneous colors may be produced at the higher resolution of 640 x 480.

Dimension Graphics, 201 Miller St, North Sydney, NSW, 2060. Tel: (02) 929 5855.

(Continued page 20)

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CGC has installed a multi-workstation network in Adelaide, as the first step in establishing a National bureau network for the digitisation of drawings for introduction into CAD systems, and the conversion of text into computer files by digitisation and conversion into ASCII codes.

INTRODUCTION OF EXISTING DRAWINGS INTO CAD

The CGC APOLLO/AUDRE system will provide the solution to getting existing drawings into CAD systems economically. Vector files will be produced in IGES, CADAM, Qik Draw, AUTOCAD, SIF (Integraph and GDS), and others, including DOGS.

TEXT CAPTURE USING OPTICAL CHARACTER RECOGNITION

The CGCA APOLLO/AUDRE network will also provide a low cost answer to the economic conversion of text into computer files, breaking down the cost barrier that has prevented the benefits of computer composition from being realised.

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CGC has great pleasure in announcing that Mapping Systems (Qld) has joined with us and will become our Queensland Bureau trading as

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- Mine management & database reporting

5 Parkview Street, Milton, Brisbane, Queensland 4064. Phone: (07) 369 3311

SOFTWARE

(Continued from page 18)

Quicknet helps create high quality color

USERS of PSDI Australia's Qwiknet Professional project management software are now able to create high quality color presentations with Qwiknet Graphics. The software supports a variety of printers and plotters, and graphic requirements are the same as for Quicknet Professional. Bar charts, histograms and network diagrams may be produced and drawings may be customised in many ways. Price: \$A1150. PSDI Australia Pty Ltd, 76 Berry Street, North Sydney, NSW 2060. Tel: (02) 923 1344.

Graphics system has 32 predefined types

BUSINESS Model Systems Pty Ltd has released Boeing Graph. This 3D graphics system is designed to run on all enhanced graphics PCs, including IBM PS/2. It is able to read Boeing Calc, Lotus, Symphony and dBase data. Graphs are chosen from 32 predefined graph types with unlimited colors and viewing angles. Price: \$A895.

Business Model Systems Pty Ltd, 3rd Floor, 518 Brunswick Street, New Farm, Qld, 4005. Tel: (07) 358 4800.

Key to standards

MINICOMP is offering Cadkey, a second-generation system that allows users to design 3D geometric models and create drawings that conform to Ansi and ISO standards.

Features include fully integrated 2D and 3D Cad, bi-directional transfer of geometry data from Cadkey to FEA, CNC, statistical packages and bi-directional Iges translator. The system runs on IBM PC or compatible and costs \$A5495.

Minicomp Pty Ltd, 104-108 Mount St, North Sydney, NSW, 2060. Tel: (02) 957 6800.

Palette of images

A DESKTOP computer may produce slides or prints of high resolution in more than 4000 colors by using a software interface between Commodore computers and the Polaroid Palette computer image recorder.

The Australian-developed system comprises a keyboard or mouse-operated graphics package and a cable adapter. It allows the Palette to record images generated by Amiga units and supports compatible graphics design packages.

Linked to a video camera or digitising tablet, the software system also allows reproduction and manipulation of digitised images from other materials.

The computer, image recorder, software and necessary peripherals cost \$A5595. Software alone is \$A795.

Neriki Computer Graphics Pty Ltd, 200 Pacific Highway, Crows Nest, NSW, 2065. Tel: (02) 957 4778.

HARDWARE

(Continued from page 19)

Drafting plotter can become a digitiser

C&PA has released a Houston Instrument scanner which turns a drafting plotter into an automatic digitiser for PC computer-aided design and drafting applications.

Called Scan-Cad, it is fully compatible with the Houston DMP-50 series drafting plotter and provides a complete scanning, production and drafting system. It inputs up to E size drawings into a PC with Cadd application.

The user may store and retrieve graphics data with the addition of a DMP-50 plotter. Scan-Cad has a 200 dot/in head that is able to detect lines as fine as .007in. It inputs a D size drawing in 12 minutes and an E size in 24 minutes. It allows input of existing drawings from paper, vellum, acetate film or blue-line.

Designed for IBM PC or compatible with at least a 10M-byte hard disk, 640k-bytes Ram and one of Houstons DMP-50 series drafting plotters, it is priced at \$A7136.

C&PA Corporate Pty Ltd, 25 Hardner Road, Mt Waverley, Vic 3149. Tel: (03) 544 4933.

VGA capability for PCs

KELLER Automation has released three VGA graphics adapters giving high resolution and wide compatibility. They provide VGA capabilities for IBM PC, PS/2 model 30 and compatibles.

■ The VGAmix 480 features 132 column mode and a fast Microsoft Windows driver. It is a half size card containing VGA hardware compatibility, VGA Bios compatibility, 35MHz palette chip and 256-bytes Dram.

■ The VGAmix 860 is able to display 16 simultaneous colors out of a palette of 800 x 600 resolutions.

■ The VGAmix 1024 will display 256 simultaneous colors in resolution up to 640 x 480 and has a double page mode.

The three are priced at \$A496; \$A681 and \$A888 respectively.

Keller Automation, 14 Whiteside Road, Clayton South, Vic, 3169. Tel: (03) 543 7244.

Monochrome graphics controller from Verticom

SOURCEWARE Pty Ltd has announced the release of the Desktop 1280 intelligent monochrome graphics controller for the IBM environment by Verticom. The manufacturer claims the 1280 offers clarity and quality equal to the best mainframe page make-up systems. When combined with a high-performance 19in monochrome monitor, such as Verticom's MD1, and page composition software, including Xerox's Ventura Publisher and Aldus' Pagemaker, the Desktop 1280 enables two A4 pages to be viewed simultaneously. The Desktop 1280 card and MD1 monitor are available separately or as a package. The package has a recommended retail price of \$A7800, including sales tax. Sourceware Pty Ltd, 586 Pacific Highway, Chatswood, NSW 2067. Tel: (02) 411 5711.

Refillable plotter pens for precision drafting

JASCO Pty Ltd of Sydney markets an extensive range of plotting tools and accessories from Rotring. The Rapidoplot line of products comprises a wide variety of disposable and refillable plotter pens which can be selected to suit specific precision drafting applications and drawing surfaces. Target markets include professional Cad environments in electrical engineering, architecture, shipbuilding, business graphics, and so on. Plotter types supported include Hewlett-Packard Series 75, Houston Instrument Series DMP, Gould Series 63, Calcomp, Benson and Nicolet Zeta Series. Jasco Pty Ltd, 937-941 Victoria Rd, PO Box 135, West Ryde, NSW 2114. Tel: (02) 807 1555.

Control Data adds four workstations to its range

CONTROL Data Australia has announced four 3D graphics workstations in its 910 family. The range is from the 910-315 model with 18M-byte disk and 8 planes priced from around \$A45,000, to the 910 model 520 with a floating point coprocessor, 16 user-bit planes, two 182M-byte disks with Icem design and drafting software included for around \$A140,000. Control Data Australia Pty Ltd, 493 St Kilda Road, Melbourne, Vic, 3004. Tel: (03) 268 9500.

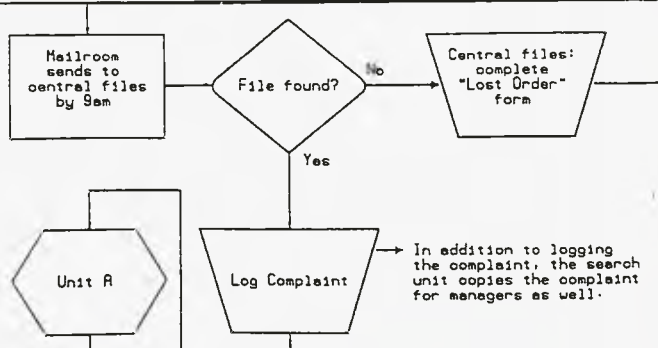
Interactive

EASYFLOW

An on-screen flowchart processor that knows about flowcharts — not just another "screen draw" program that makes you do most of the work. EasyFlow is a powerful full-screen graphics program dedicated to flowcharts and organisation charts. With it you can quickly compose charts. More important, you can easily modify charts so they are always up to date.

- **Automatic:** fully automatic text centering within shapes, both horizontally and vertically. Fully automatic line routing.
- **Fast:** Written in assembly language for speed.
- **Large:** Charts up to 417 columns wide by 225 lines high. Chart too large for your printer? EasyFlow automatically breaks the chart up & prints it in page size pieces.
- **Standard:** All standard flowcharting shapes included. Custom shapes can be added.
- **It prints:** on most popular matrix printers including IBM, Epson, Toshiba, HP LaserJet, LaserJet-Plus and many others.
- **It plots:** on HP7475 and compatible plotters.
- **It works:** we are contractually prevented from mentioning the name of the "big eight" accounting firm that purchased a world-wide site license, but we can tell you that they spent months evaluating all available flowcharting packages before settling on EasyFlow.
- **Documented:** (100+ page) manual and over 150 screens of context sensitive help.

EasyFlow works on IBM PC's and compatibles. Requires 320 K memory, Dos 2.0 or higher and an IBM CGA, IBM EGA or Hercules monochrome adapter card.



The chart fragment above was produced on an HP Laser-Plus and is actual size and unretouched. Publication quality charts like this can be produced using only minutes of preparation time and seconds of print time.

Business Planning Associates Pty Ltd
#6 Gilroy Way, Lesmurdie WA 6076. Phone: (09) 291 7472.

The computer system which reads drawings
Scanning and drawing conversion service
WA Bureau opens

Engineering Drawings

- * Full symbol/text/line recognition
- * Raster/Vector conversion
- * Output to various CAD systems including Intergraph, Autocad, GDS, Computervision
- * Output tailored to specific client requirements

Text Documents

- * Type written documents — any font
- * Data available for word processing, printing, and information retrieval services.

Bureau staffed by qualified CAD/drafting personnel.
Contact: Aidan Montague

ITC SOFTWARE LIMITED

2nd Floor, 7 Havelock Street
West Perth WA 6005

Phone: (09) 324 1674
Fax: (09) 324 1673

SPOTLIGHT ON

Graphics workstations

compiled by
Gillian Sidebottom

Model/ Manufacturer	Price (\$A inc.tax)	Specification											Display						Graphics routine								
		Processors	Operating system	Main Memory (M-bytes) (Upgradable to)	Processing Speed (Mips)	Standard Interface	Graphics Standards Support	User Interface	Hard Copy Devices Supported	Video support	Networking	Applications Software Support	Specific markets addressed	Screen size (diag.")	Monochrome/color	Number of colors Total palette/per display	2D/3D	Resolution (pixels)	Vectors per second	Number of planes	Number of fonts	Windowing	Zoom/Pan	Dragging	Dynamic 3D rotation	Smooth shading	Anti-Aliasing
CONTROL DATA AUSTRALIA PTY LTD — 493 St Kilda Rd, Melbourne 3004. Tel: (03) 268 9500																											
910-537 Silicon Graphics/ Control Data	\$123,000+	Mips, Risc, 12.5 MHz, Mips FPU + Graphics Proc.	Unix VBSD 4.3	8Mb (16Mb)	10	RS232C, VME Bus SCSI (Ethernet Opt)	IRIS (GKS PHIGS Opt)	K M (Di, BB Opt)	Inkjet Thermal Laser Plotter	✓	✓	Wide range	Cad/Cam Cae	19"	C	16.7M 4096	✓	1280 x 1024	147K	8 col + 4 disp	-	✓	✓	✓	✓	✓	✓
910-520 Silicon Graphics/ Control Data	\$144,000 +	Mips, Risc, 12.5 MHz FPU Graphics Proc	Unix VBSD 4.3	8Mb (16Mb)	10	RS232C, VME Bus SCSI (Ethernet Opt)	IRIS (GKS PHIGS Opt)	K M (Di, BB Opt)	Inkjet Thermal Laser Plotter	✓	✓	Wide range	Cad/Cam Cae	19"	C	16.7M 4096	✓	1280 x 1024	147K	12 col + 4 disp	-	✓	✓	✓	✓	✓	✓
910-340 Silicon Graphics/ Control Data	\$104,000+	68020/Weitek FPU, + Graphics Proc	Univ V BSD 4.2	8Mb (16Mb)	1.7	RS232C, Multibus RGB Ethernet	IRIS (GKS PHIGS Opt)	K M (Di, BB, D, P Opt)	Inkjet Thermal Laser Plotter	✓	✓	Wide range	Cad/Cam Cae	19"	C	16.7M 4096	✓	1024 x 1024	110K	32	-	✓	✓	✓	✓	✓	✓
910-337 Silicon Graphics/ Control Data	\$74,000+	68020/Weitek FPU, + Graphics Proc	Univ V, BSD 4.2	8Mb (16Mb)	1.7	RS232C, Multibus RGB Ethernet	IRIS (GKS PHIGS Opt)	K M (Di, BB D, P Opt)	Inkjet Thermal Laser Plotter	✓	✓	Wide range	Cad/Cam Cae	19"	C	16.7M 256 (Opt 4096)	✓	1024 x 1024	110K	8	-	✓	✓	✓	✓	✓	✓
910-320 Silicon Graphics/ Control Data	\$82,000+	68020/Weitek FPU + Graphics Proc	Univ V, BSD 4.2	8Mb (8Mb)	1.7	RS232C, Multibus RGB Ethernet	IRIS (GKS PHIGS Opt)	K M (Di, BB, D, P)	Inkjet Thermal Laser Plotter	✓	✓	Wide range	Cad/Cam Cae	19"	C	16.7M 4096	✓	1024 x 1024	110K	12	-	✓	✓	✓	✓	✓	✓
910-315 Silicon Graphics/ Control Data	\$43,000+	68020/Weitek FPU + Graphics Proc	Univ V, BSD 4.2	4Mb (8Mb)	1.7	RS232C, Multibus RGB (Ethernet Opt)	IRIS (GKS PHIGS Opt)	K M (Di, BB, D, P)	Inkjet Thermal Laser Plotter	✓	✓	Wide range	Cad/Cam Cae	15" 19"	C	4096/ 256	✓	1024 x 1024	110K	8 (Opt 12)	-	✓	✓	✓	✓	✓	✓
DATA GENERAL AUSTRALIA — 100 Dorcas St, South Melbourne, Vic 3205. Tel: (03) 698 6988																											
DS/750 Series/ Data General	PoA	DS/7500	AOS/US DG/UX	4Mb (12Mb)	1	DRVII B, VME IEEE-488	GKS	K M P	Parallel/Serial Printers, Plotters	✓	✓	TEO (Technical Electronic Office)	Publ, AEC, LIS	15" 19"	M C	16M 256	✓	1280 x 1024, 1024 x 800	25K	8	-	✓	✓	-	-	✓	-
GDC/286 Data General	PoA	80286/ 80186	MS-Dos, Xenix	640Kb (4.6Mb)	1	-	VDI, CGI, CGA, PGL	K M	Parallel/Serial printers, Plotters	✓	✓	-	Publ, AEC, L 15	15"	C	4096/ 256	✓	1024 x 800	25K	8	-	✓	✓	✓	✓	✓	-
DATAMATIC PTY LTD — 9 Byfield St, North Ryde, NSW 2113. Tel: (02) 888 1788																											
Tele 386/Televideo	\$24,336	80386/80387	MS-Dos, Unix v.3 Dos Merge 386	2Mb (16Mb)	2	RS232C, Parallel Ethernet IEEE 8023	GKS, CGA, Metheus, X Windows	K M T	Printers, Plotters Calcomp Colomaster	✓	✓	Autocad Versacad, P-Cad, Cadkey Halo, Gem, TGrat	Cad/Cae BPG	15" 19"	C	4096 or 16.7M 16 or 256	2D	1024 x 1024 1024 x 768	10M pixels per sec	4 or 8	1	✓	✓	✓	-	✓	-
DATATEL PTY LTD — 19 Raglan St, South Melbourne, Vic 3205. Tel: (03) 690 4000																											
Model 402/Micro Display Systems	\$3500	-	MS-Dos	128K	-	IBM Comp. PC	-	K M P	Parallel/Serial printers incl/ Laserjet	✓	✓	Windows, Gem Autocad, Halo Dr Draw etc	Comm text/ graphics	15"	M	-	✓	736 x 1008	-	1	30	✓	✓	-	-	-	✓
Model Aycon 17/ Aydin Controls	\$11,400	-	Special	48K	-	RS232C	ISC- 8001G	K M P J CPU	Serial printers Inc. Laserjet	✓	✓	Format graph- ics II Geminay III	IND, Comms, PE	19"	C	8/8	2D	700 pixels per line	-	2	128	✓	-	-	-	✓	✓
DIGITAL EQUIPMENT CORPORATION (AUSTRALIA) PTY LTD — PO Box 384, Chatswood, NSW 2067. Tel: 412 5252																											
Vaxstation 2000	PoA	Microvax II	VMS or Ultrix	4Mb (6Mb)	-	-	GKS	K M	DEC Laso LN03, LN03S, LVP16, LCP01, HP7475, 7550, 7580, 7585, 7510	-	✓	Extensive range	Cad/Cam Fin. Electr	19" 15"	M C	16.7M 16M	2D	1024 x 864	-	1 or 4	-	✓	-	-	-	-	-
Vaxstation II	PoA	Microvax	VMS or Ultrix	3Mb (16Mb)	-	Q-bus	GKS, Vis X Windows	K M	As Vaxstation 2000	-	✓	Extensive range	Non specific	19"	M	-	2D	1024 x 864	-	4	-	✓	-	-	-	-	-
Vaxstation III/GPX	PoA	-	VMS or Ultrix	3Mb (16Mb)	-	Q-Bus	GKS VIS X Windows	K	As Vaxstation 2000	-	✓	Extensive range	Non specific	19"	M C	16.7M 256 or 16	2D	1024 x 864	-	4 or 8	-	✓	-	-	-	-	-
Vaxstation 3200	PoA	Microvax 3000	VMS or Ultrix	16Mb	-	Q-bus	GKS VIS	K	As Vaxstation 2000	-	✓	Extensive range	Non specific	19"	C	16.7M 256	2D	1024 x 864	-	8	-	✓	-	-	-	-	-
Vaxstation 3500	PoA	Microvax 3000	VMS or Ultrix	16Mb (32Mb)	-	Q-bus	GKS VIS X Windows	K M	LA50, LN03, LN03S, LCP01, LVP16, HP7475, 7550, 7580, 7585, 7510	-	✓	Extensive range	Cad/Cam Cim Electr Fin.	19"	M C	16.7M 256	2D 2D	1024 x 864	-	8	-	✓	-	-	-	-	-

Major advances in technology

THERE is a great deal of activity in the graphics workstation market, with rapid advances in technology resulting in a stream of powerful and highly sophisticated products for specialised applications in Cad/Cam, research and development, science and engineering and related fields.

The use of increasingly powerful processors has enabled the provision of the extended memory and faster speeds required by the new generation of high resolution displays. The availability of 2560 x 2480 screen resolution has been an important, if not revolutionary, development for the computer graphics industry and it has been estimated that systems available in the late 1970s and early 1980s were on average eight to ten times slower than current models.

In addition to improvements in speed, the professional markets addressed by these highly specialised products have focused attention on the need to provide precision graphics and a wide range of complex routines in two or three dimensional mode, in either standalone or networked configurations. Compatibility with a range of emerging industry standards is also an important issue.

Graphics Workstations — Key to Abbreviations

✓ heading applies
- heading does not apply, or information not supplied

PoA Price on Application
prop. proprietary

Users Interface

K Keyboard
M mouse
P light pen
T tablet
D digitiser
St stylus
J joystick
B bezel
BB button box
BCR barcode reader
RK rotary knobs Di dials
Th thumbwheels V video

Specific Markets Addressed

AEC Architectural Engineering and Construction
AI Artificial Intelligence
An Animation
Arch Architecture
BPG Business presentation graphics
Cad/Cam/Cae/Case Computer Aided Design/Manufacturing/Engineering/Software Engineering
Comm Commercial
Ed Education
Emap Electrical Mapping
Eng Engineering
Govt Government
Ind Industrial
LIS Land Information Systems
Min Mining
Mod Modelling
MSE Manufacturing Software Engineering
Publ Publishing
Sc Scientific

Australian
Design Award
1987



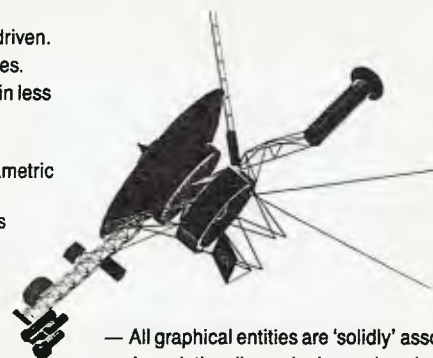
QIK DRAW



AUSTRALIAN MADE

AUSTRALIA'S CAD SOLUTION

- 2D and 3D Modules.
- Completely 'on-screen' menu driven.
- Screen menu selection of all files.
- Heads-up approach, resulting in less user fatigue.
- 2 day initial training.
- Direct interfacing enables parametric sub-drawings to be produced.
- All major Plotters and Digitisers supported.



- All graphical entities are 'solidly' associated.
- Associative dimensioning makes drawing modification simpler.
- Password protection at two levels (system entry and data retrieval).
- Available for the NEC APCIV POWERMATE 1 and POWERMATE 2 range of computers.

NEC

**QIK DRAW
SYSTEMS
PTY. LIMITED**

Adelaide Innovation House West, Technology Park,
The Levels 5095, South Australia.
Tel: (08) 260 8278. Fax: (08) 260 8100. Tlx: AA88556
Melbourne 126 Russell St, Melbourne 3000, Victoria.
Tel: (03) 654 5847

Model/ Manufacturer	Price (\$A inc.tax)	Specification												Display							Graphics routine						
		Processors	Operating system	Main Memory (M-bytes) (Upgradable to)	Processing Speed (Mips)	Standard Interface	Graphics Standards Support	User Interface	Hard Copy Devices Supported	Video support	Networking	Applications Software Support	Specific markets addressed	Screen size (diag. in)	Monochrome/color	Number of colors Total palette/display	2D/3D	Resolution (pixels)	Vectors per second	Number of planes	Number of fonts	Windowing	Zoom/Pan	Dragging	Dynamic 3D rotation	Smooth shading	Anti-Aliasing
DOMAIN COMPUTER PTY LTD — 9th Floor, 50 Berry St, North Sydney, NSW 2060. Tel: (02) 957 3382																											
DN3000-L/Apollo Computer, Inc	\$9000+	68020/68881	Aegis, Unix V BSD 4.2 MS-Dos	2Mb (8Mb)	1.4	RS232C	PHIGS, GKS	KM	Most printers plotters Tektronix 4692	✓	✓	1200+pkgs Cad, AI Mapping etc	Eng/Arch Min.Govt Ed.	15" M	-	✓	1024 x 800	6500 2000	-	30+	✓	✓	✓	✓	✓	✓	x
DN3000-E/Apollo Computer, Inc	\$21,000+	68020/68881	Aegis, Unix V BSD 4.2 MS-Dos	2Mb (8Mb)	1.4	RS232C	PHIGS, GKS	KM	Most printers plotters Tektronix 4692	✓	✓	1200+pkgs	Eng/Arch Min.Govt Ed.	15" 19" C	16.7M 256	✓	1024 x 800	6500 2000	8	30+	✓	✓	✓	✓	✓	✓	x
DN4000-Apollo Computer, Inc	\$27,000+	68020/68881	Aegis, Unix V BSD 4.2 MS-Dos	4Mb (32Mb)	4	RS232C	PHIGS, GKS	KM	Most printers plotters Tektronix 4692	✓	✓	1200+pkgs	Eng/Arch Min.Govt Ed.	15" 19" M/C	16.7M 256	✓	1024 x 800	13K 4000	8	30+	✓	✓	✓	✓	✓	✓	x
DN590T/Apollo Computer, Inc	\$90,000+	68020/68881	Aegis, Unix V BSD 4.2 MS-Dos	8Mb (32Mb)	3.5	RS232C	PHIGS, GKS	KM	Most printers plotters Tektronix 4692	✓	✓	1200+pkgs	Eng/Arch Min.Govt Ed.	19" C	16.7M 16.7M	✓	1280 x 1024	150K 130K	24	30+	✓	✓	✓	✓	✓	✓	x
ECS-ENGINEERING COMPUTER SALES — 1155 Malvern Rd, Malvern, Vic 3144. Tel: (03) 209 9135																											
Unisys-Graftek 1450 Cad/Cam Pkg	PoA	68020/68881	Unix	4Mb (12Mb)	3	RS232C, Ethernet	GKS	KTP	Printers, Plotters Paper Tape, NC machines	-	✓	Graftek-GMS and all Unix-based	Cad/Cam	19" C	16M 256	✓	1024 x 768	-	8	8+	-	✓	✓	✓	✓	✓	-
GENIGRAPHICS CORPORATION (AUSTRALIA/NEW ZEALAND) — Suite 1, "The Clivedon", 596 St Kilda Rd, Melbourne 3004. Tel: (03) 529 6422C																											
100D-Plus 11/53	\$122,100	Dec Micro PDP 11/53	RSX-11M-plus (Version 3D)	512Kb (20Mb)	-	Async. Sync.	CGM	KMPTV	Laser/inkjet printer camera	✓	✓	Vector Paint Animation Texture	Slide/Video Prod. Corp & Adv.	13" C	256	2D	-	-	-	20	-	✓	✓	✓	✓	✓	✓
SG53	\$71,300	Dec Micro PDP 11/53	RSX-11M-plus	512Kb (20Mb)	-	Async. Sync.	CGM	KMPT	Laser/inkjet printer	✓	✓	Vector Texture	Slide/Video Prod. Corp & Adv.	13" C	256	2D	-	-	-	20	-	✓	-	-	✓	✓	✓
HEWLETT-PACKARD AUSTRALIA PTY LTD — 31-41 Joseph St, Blackburn, Vic 3130. Tel: (03) 895 2895																											
HP9000 Model 318M	\$11,190	68020/68881	HP-UX (Unix)	4Mb	2.3	RS232C, IEEE 488	GKS DGL/AGP	KMDBB	Various Printers/ Plotters	✓	✓	-	Cad/Cam SC Eng	17" M	-	2D	1024 x 768	59K	-	1	✓	✓	✓	-	-	-	
HP9000 Model 330 MH	\$29,020	68020/68881	HP-UX (Unix)	4Mb (8Mb)	2.3	RS232C, IEEE 488	GKS DGL/AGP	Total 7 RKB	Various Printers/ Plotters	✓	✓	-	Case/Cae Cap, Cad/Cam	17" M	-	2D	1280 x 1024	59K	-	1	✓	✓	✓	-	-	-	
HP9000 Series 330 CH	\$38,650	68020/68881	HP-UX (Unix)	4Mb (8Mb)	2.3	RS232C, IEEE 488	GKS DGL/AGP	Total 7 BCR	Various Printers/ Plotters	✓	✓	-	Cad/Cam SC Eng	16" C	16M 256	2D	1280 x 1024	59K	10	1	✓	✓	✓	-	-	-	
HP9000 Model 350 MH	\$51,600	68020/68881	HP-UX (Unix)	4Mb (32Mb)	4	RS232C, IEEE 488	GKS AGP/DGL	Total 7 RK	Various Printers/ Plotters	✓	✓	-	Case Cap Cae/Cad SC	19" M	-	2D	1280 x 1024	75K +	-	1	✓	✓	✓	-	-	-	
HP9000 Model 350 CH	\$75,150	68020/68881	HP-UX (Unix)	4Mb (32Mb)	4	RS232C, IEEE 488	GKS AGP/DGL	Total 7 D	Various Printers/ Plotters	✓	✓	-	Cad/Cam Eng SC	19" C	16M 256	2D	1280 x 1024	75K +	10	1	✓	✓	✓	-	-	-	
HP9000 Model 350 SRX	\$125,460	68020/68881	HP-UX (Unix)	8Mb (16Mb)	4	RS232C, IEEE 488	GKS AGP/DGL PHIGS GG-VDI Starbase	Total 7 BB	Various Printers/ Plotters	✓	✓	-	Cae, Mod	19" C	16M 256	3D	1280 x 1024	190K	32	-	✓	✓	✓	✓	✓	✓	
HP9000 Model 825 SRX	\$155,680	Precision Architecture	HP-UX (Unix)	8Mb (48Mb)	8.2	RS232C, IEEE 488	GG-VDI Core GKS PHIGS	Total 11 MT	Various Printers/ Plotters	-	✓	-	Cae/Mod	19" C	16M 256	3D	1280 x 1024	190K	32	-	✓	✓	✓	✓	✓	✓	
IBM AUSTRALIA LTD — 5 Coonara Ave, West Pennant Hills, NSW 2120. Tel: (02) 634 8688																											
IBM 3192/G	\$5275 (ex tax)	-	-	-	-	IBM 3174, 3274	GDDM V1, R4 or V2	IBM 5227 M	Wide range of printers & plotters	-	-	-	-	14" C	8	-	720 x 384	-	-	-	-	-	-	-	-	-	
INTERGRAPH CORPORATION PTY LTD — 55-61 Talavera Rd, North Ryde, NSW 2131.Tel: (02) 888 9900																											
Interpro 220/ Intergraph Corp	PoA	Prop. Raster ops. proc/Fairchild clipper 80186 co-roc.	Unix V PC-Dos	8Mb (16Mb)	5	SCSI, RS232C, Ethernet	GKS (Opt)	KMD	Inc. color thermal, electrostatic printer	x	✓	-	Arch. Eng E Map	19" C	4046 32	✓	1184 x 884	25K	5	-	✓	✓	✓	✓	✓	x	
OPEN COMPUTER SYSTEMS PTY LTD — 10th Floor, 77 Pacific Highway, North Sydney, NSW 2060. Tel: (02) 957 2655																											
Sun-3	PoA	68020	Unix BSD 4.2 & V	4-8Mb (4-32Mb)	1.5 4	VME bus SCSI, SMD	GKS Core CGI	KMS	Wide range Plotters & Printers	✓	✓	Frame Solar Paint, Data-views, Alis	Cad/Cam Publ. AI, OA, Grit, Fin	15" 19" M C	16.7M	✓	1600 x 1280	200K 150K	Up to 8	Up to 21	✓	✓	✓	✓	✓	✓	

Sun, Cimlinc in OEM pact

SUN Microsystems and Cimlinc have signed OEM and third-party developer agreements under which Cimlinc's 32-bit computer integrated manufacturing software will run on Sun's technical workstations and networked systems.

The initially exclusive OEM agreement is valued at \$US25 million over 18 months.

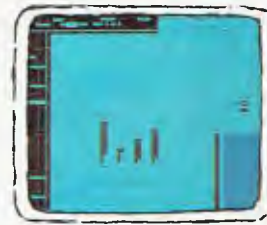
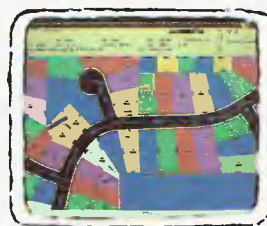
In the third party developer agreement, Cimlinc has made its computer integrated manufacturing (Cim) software packages available unbundled to Sun's installed base of more than 45,000 Sun-2, Sun-3 and Sun-4 workstations.

Commenting on the new agreements, Sun Microsystems Australia managing director, Val Mickan said: "Sun was attracted to Cimlinc because of its strategic position in the Cim marketplace as a supplier of products which go beyond the traditional graphics-oriented mechanical design and manufacturing solutions and because of Cimlinc's serious commitment to Sun in the form of an initially exclusive OEM agreement," Mickan said.

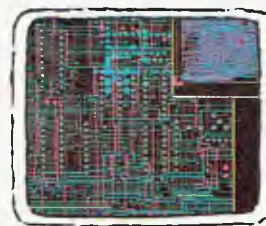
Future product development at Cimlinc will focus on advanced software tools including intelligent documentation. In design engineering this includes further enhancement of Cimlinc's 3D wireframe and solid modelling software.



ANIMATION

ARCHITECTURAL,
CIVIL & STRUCTURAL
ENGINEERINGARTIFICIAL
INTELLIGENCECOMPUTER AIDED
PUBLISHING

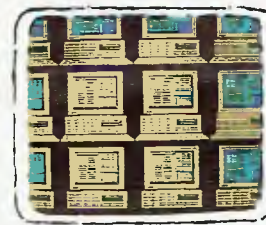
EARTH RESOURCES

ELECTRONIC
DESIGN, & AUTOMATION

FINANCIAL



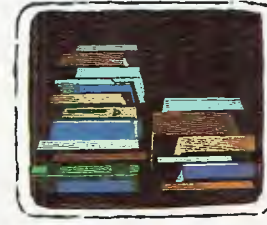
GRAPHICS UTILITY

MECHANICAL
ENGINEERING

36,000 INSTALLATIONS



1,900 CUSTOMERS

1250+ 3rd PARTY
SOFTWARE APPLICATIONS

OPEN COMPUTER SYSTEMS PTY LTD — 10th Floor, 77 Pacific Highway, North Sydney, NSW 2060. Tel: (02) 957 2655 — Cont.

Sun-4	PoA	SPA C or MB86900	Unix BSD 4.2 & V	8-32Mb (128Mb)	10	VME bus SCSI SMD	GKS Core CGI	K M S	Wide range of plotters, printers, type-setters	✓	✓	Alis, Dataviews Frame Solar Paint	Cad/Cam Publ. AI. OA, Gvt. Fin.	19"	M C	16.7M	✓	1600 x 1280	200K 150K	Up to 8	Up to 21	✓	✓	✓	✓	✓
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PRIME COMPUTER AUSTRALIA PTY LTD — 15 Blue Street, North Sydney, NSW 2060. Tel: (02) 929 0044

PXCL 5500	PoA	Mips, Risc	PXOS	4Mb (16Mb)	10	RS232C	PHIGS	KM	Various	✓	✓	-	MFRG, Min etc	19"	C	16.7M 4096 or 16.7M	3D	1280 x 1024	-	8-24	-	✓	✓	✓	✓	✓	✓	✓	✓
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REMINGTON — Integrated Solutions Division — 5 Wentworth Ave, Sydney 2000. Tel: (02) 264 9588

Integrated Solutions Optimum V	PoA	68020 (16MHz)	Unix VBSD 4.3	4Mb (56Mb)	4	VME bus Ethernet	GKS CORG Graphics	K M	Wide range of serial parallel, laser printers	✓	✓	-	AIM SE OA	19"	M C	4096 16	✓	1280 x 1024	-	1	30	✓	✓	✓	✓	✓	✓
Integrated Solutions System 400	PoA	68020 (25MHz)	Unix VBSD 4.3	4Mb (56Mb)	4	VME bus Ethernet	GKS CORG Graphics	K M	Wide range of serial parallel, laser printers	✓	✓	-	AIM SE OA	19"	M C	4096 16	✓	1280 x 1024	-	1	30	✓	✓	✓	✓	✓	✓

SCHLUMBERGER SYSTEMS PTY LTD — 382 Wellington Rd, Mulgrave, Vic 3170. Tel: (03) 560 1166

GW 4790/Applicon	\$80,000	Micro Vax II, DEC 78032/78132	Micro VMS	5Mb (16Mb)	0.9	Ethernet		KT St.	Seico Benson	✓	✓	Applicon Cad/ Cam/Cae	Mech/ Electro/ Mech.	19"	C	16.7M 256	✓	1280 x 1024	50K	8	8	✓	✓	-	✓	✓	✓	✓	✓
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SUN MICROSYSTEMS — Unit 2, 49-53 Hotham Pde, Artarmon, NSW 2064. Tel: (02) 436 4699

3/260	PoA	68020	Sun OS Unix	4Mb (24Mb)	4	RS232C, Ethernet	GKS CGM CGI Sun- core, PHIGS X windows X News	K M	Laser printers Serial printers	✓	✓	Wide range	Cad/Cam Cap/Case	19"	C High Res. M	Inf. 256	✓	1152 x 900 1600 x 1280	-	2	36	✓	✓	✓	✓	✓	✓	-
3/110	PoA	68020	Sun OS Unix	4Mb (12Mb)	2	RS232C, Ethernet	GKS CGM CGI Sun- core, PHIGS X windows X News	K M	Laser printers Serial printers	✓	✓	Wide range	Cad/Cam Cap/Case	19"	C	Inf. 256	✓	1152 x 900	-	3	36	✓	✓	✓	✓	✓	✓	-
3/60	PoA	68020	Sun OS Unix	4Mb (24Mb)	3	RS232C, Ethernet	GKS CGM CGI Sun- core PHIGS X Windows News	K M	Laser printers Serial printers	✓	✓	Wide range	Cad/Cam Cap/Case	19" 16"	M C	Inf. 256	✓	1152 x 900/ 1600 x 1280	-	3	36	✓	✓	✓	✓	✓	✓	-
3/50	PoA	68020	Sun OS Unix	4Mb	2	RS232C, Centronix Ethernet	GKS CGM CGI Sun- core, PHIGS X Windows News	K M	Laser printers Serial printers	✓	✓	Wide range	Cad/Cam Cap/Case	19"	-		✓	1152 x 900	-	M	36	✓	✓	✓	✓	✓	✓	-

TCG SYSTEMS AUTOMATION — 30 Balfour St. Chippendale, NSW 2008. Tel: (02) 699 8300

Silicon Graphics Iris Systems	\$40-250,000	32-bit Risc CPU/68020	Unix V.3, B.4.3	8Mb (16Mb)	10	RS232C, Centronics Ethernet	Silicon Graphics 3D library	K M D B Di	Inkjet Printers Video Film	✓	✓	200 + 3D applications available	Eng. Mod An	19"	C	4096 16M	✓	1024 x 1280	140K	Up to 52	-	✓	✓	✓	✓	✓	✓
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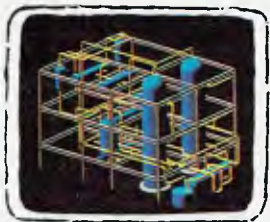
TEKTRONIX AUSTRALIA PTY LTD — 80 Waterloo Rd, North Ryde, NSW 2113. Tel: (03) 888 7066

Tektronix 4315	PoA	68020	Utek (Berk 4.2)	5Mb (13Mb)	2.5	RS232C, Centronics Ethernet	GKS Core Plot-10	KM	Printers Plotters	-	✓	-	-	-	13"	M	-	2D	640 x 480	-	1	-	✓	✓	✓	-	-	-
Tektronix 4316	PoA	68020	Utek (Berk 4.2)	4Mb (12Mb)	2.5	RS232C, Centronics Ethernet	GKS Core Plot-10	KM	Printers Plotters	-	✓	-	-	-	19"	M	16 16	2D	1376 x 1024	-	4	-	✓	✓	✓	-	-	-
Tektronix 4317	PoA	68020	Utek (Berk 4.2)	4Mb (12Mb)	2.5	RS232C, Centronics Ethernet	GKS Core Plot-10	KM	Printers Plotters Color copiers	-	✓	-	-	-	19"	C	4096 16	2D	1376 x 1024	-	4	-	✓	✓	✓	-	-	-
Tektronix 4324	PoA	68020/prop	Utek (Berk 4.2)	4Mb (12Mb)	3	RS232C, Centronics Ethernet	GKS Core Plot-10	K M T Th	Printers Plotters Color copiers	✓	✓	-	-	-	16" 19"	C	16M 256	2D	1024 x 768	100K	8	-	✓	✓	✓	-	-	-
Tektronix 4325	PoA	68020/prop	Utek (Berk 4.2)	4Mb (12Mb)	3	RS232C, Centronics Ethernet	GKS Core Plot-10	K M T Th	Printers Plotters Color copiers	✓	✓	-	-	-	16" 19"	C	16M 256	2D	1280 x 1024	100K	8	-	✓	✓	✓	-	-	-
Tektronix 4385	PoA	68020/prop	Utek (Berk 4.2)	4Mb (12Mb)	3	RS232C, Centronics Ethernet, DMA	GKS Core Plot-10	K M T Th Di	Printers Plotters Color copiers	✓	✓	-	-	-	16" 19"	C	16M 16-16M	✓	1024 x 1024	450K 350K	4 to 24	-	✓	✓	✓	-	-	-
Tektronix 4337	PoA	68020/prop	Utek (Berk 4.2)	4Mb (12Mb)	3	RS232C, Centronics Ethernet, DMA	GKS Core Plot-10	K M T Th Di	Printers Printers Color copiers	✓	✓	-	-	-	16" 19"	C	16M 4096-16M	✓	1280 x 1024	450K 350K	4 to 24	-	✓	✓	✓	✓	-	-
Tektronix 4336	PoA	68020/prop	Utek (Berk 4.2)	4Mb (12Mb)	3	RS232C, Centronics Ethernet DMA	GKS Core Plot-10	K M T Th Di	Printers Plotters Color copiers	✓	✓	-	-	-	16" 19"	C	16M 256-16M	✓	1280 x 1024	450K 350K	8 to 24	-	✓	✓	✓	✓	-	-

KEY: ✓ = heading applies; - = heading does not apply, or information not supplied; PoA = Price on Application; prop = proprietary. **Users Interface:** K = Keyboard; M = mouse; P = light pen; T = tablet; D = digitiser; St = stylus; J = joystick; B = bezel; BB = button box; BCR = barcode reader; RK = rotary knobs; Th = thumbwheels; Di = dials; V = video. **Specific Markets Addressed:** AEC = Architectural Engineering and Construction; AI = Artificial Intelligence; AN = Animation; Arch = Architecture; BPG = Business presentation graphics; Cad/Cam/Cae/Case = Computer Aided Design/Manufacturing/Engineering/Software Engineering; Comm = Commercial; Ed = Education; Emap = Electrical Mapping; Eng = Engineering; Govt = Government; Ind = Industrial; LIS = Land Information Systems; Min = Mining; Mod = Modelling; MSE = Manufacturing Software Engineering; Publ = Publishing; Sc = Scientific.



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Highend processor for Sun users

RASTER Technologies, of Massachusetts, has introduced a graphics processor designed for high-performance two- and three-dimensional applications. In announcing the Model One/385, the company also introduced the first two members of its family of GX4000 3-D graphics accelerators, which were designed for use with Sun Microsystem workstations.

The Model One/385 is reported to have a proprietary IEEE floating-point processor architecture that is optimised for 2-D and 3-D graphics algorithms. The company claims that the system processes up to 140,000 3-D vector/sec. It was designed to provide resolution of 1280 by 1024 pixels, support for eight local light sources and up to 16.7 million colors. It also features a built-in direct-memory access interface for connections to a range of processors.

Prices start at \$A33,000 and availability scheduled for the fourth quarter. Raster Technologies also announced a collaborative agreement with Sun, under which the companies will work to ensure graphics software portability between the Sun-3 and Sun-4 workstation families and Raster's GX4000 series.

The GX4000 series was designed to speed execution of proposed Phigs and Phigs+ standards. A configuration that includes 8M-bytes of display-list memory costs \$US38,995.



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